



HOKKAIDO UNIVERSITY

Title	JAPANESE SPECIES OF THE SUBFAMILY OECOPHYLLEMBIINAE RÉAL ET BALACHOWSKY (LEPIDOPTERA : GRACILLARIIDAE), WITH DESCRIPTIONS OF A NEW GENUS AND EIGHT NEW SPECIES
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**JAPANESE SPECIES OF THE SUBFAMILY OECOPHYLLEMBIINAE RÉAL
ET BALACHOWSKY (LEPIDOPTERA: GRACILLARIIDAE), WITH
DESCRIPTIONS OF A NEW GENUS AND EIGHT NEW SPECIES**

By TOSIO KUMATA

Abstract

KUMATA, T. 1998. Japanese species of the subfamily Oecophyllembiinae Réal et Balachowsky (Lepidoptera: Gracillariidae), with descriptions of a new genus and eight new species. *Ins. matsum.* n. s. 54: 77 – 131, 27 figs. (11 text-figs., 16 pls.).

The subfamily Oecophyllembiinae is redefined to receive the genera *Metriochoa* Braun (= *Oecophyllembius* Silvestri), *Cryphiomystis* Meyrick, *Guttigera* Diakonoff, *Prophyllonistis* Davis and *Eumetriochoa* (gen. nov.) on the basis of the hind wing venation and the larval thoracic spiracles. So far as the larvae of eight species belonging to this subfamily are examined, thoracic spiracles are not opened on the prothorax, but on the mesothorax at the anterolateral areas in both the sap-feeding and spinning morphs. The thoracic spiracles opened on the mesothorax in lepidopterous larvae may be a new discovery to the entomological science.

Four species of *Eumetriochoa*, two of *Metriochoa* and two of *Cryphiomystis* are dealt with in this paper, and all the species are new to science. Larvae of Japanese species are all leaf-miners on various arboreal plants mainly belonging to the families Rubiaceae or Oleaceae.

Photographs of the moths and leaf-mines, and also drawings of the wing venations and genitalia, are given for all the species. Larval photographs are also provided for some species to show the thoracic spiracles. A tentative list of the world species of the subfamily is given in Appendix I, and a list of food plants of these species is also given in Appendix II.

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INTRODUCTION

Since the subfamily Oecophyllembiinae was established in 1966 by Réal & Balachowsky for *Oecophyllembius neglectus* Silvestri, 1908 [= *Metriochroa latifoliella* (Milliere, 1887)], it has not been cited in taxonomic papers of the Gracillariidae at all. The description is published in "Entomologie Appliquée à l'agriculture", and is written with short descriptive notes. As cited in "The generic names of moths of the world, vol. 6" (Nye & Fletcher, 1991), however, the name Oecophyllembiinae is available to the Zoological Nomenclature.

In 1994, on the other hand, Davis referred the genera *Metriochroa* Busck, 1900 (= *Oecophyllembius* Silvestri, 1908), *Cryphiomystis* Meyrick, 1922 and his new genus *Prophyllonistis* to the subfamily Phyllocnistinae together with the genus *Phyllocnistis* Zeller, 1848 under the family Gracillariidae. According to him, the Phyllocnistinae are characterized by the similar serpentine type of the larval leaf-mine and by the similar pattern of the larval transformation (several early instars of the sap-feeding morph followed by one or two instars of the spinning morph before the pupa).

In the course of my studies on the Japanese species and some Southeast Asian ones of the Gracillariidae, I have found that the genera *Metriochroa* and *Cryphiomystis*, and also a new genus to be described in this paper, form a very peculiar group, which is characterized mainly by the long-stalked veins Rs and M₁ of the hind wing in adult stage and by a pair of thoracic spiracles opened on the mesothorax in larval stage. It is well recognized that the lepidopterous larvae possess one pair of thoracic spiracles opened at the posterolateral areas of the prothorax without exception (Stehr, 1987; Scoble, 1992). So far examined, five Japanese and three Southeast Asian species belonging to *Metriochroa*, *Cryphiomystis* and a new genus possess in common a pair of spiracles opened at the anterolateral areas of the mesothoracic segment in both the early sap-feeding and late spinning larval morphs (see Figs.16–20). This character is unusual to Lepidoptera, but it may serve to distinguish the group in question not only from the genus *Phyllocnistis* but also from the subfamilies Gracillariinae and Lithocolletinae. As discussed in the later pages in detail, several unique characters to this group are found in larval and adult stages. On the basis of these characters I wish to place the group at a subfamily rank. In this case the name Oecophyllembiinae will necessarily be adopted to the group.

According to the figure given by Davis (1994), the spinning larva of *Prophyllonistis epidrimys* Davis possesses the thoracic spiracles on the prothorax. Besides this character, the chaetotaxy of the spinning larva and the wing venation of the adult show that the species does not belong to the Phyllocnistinae, but to the Oecophyllembiinae. The genus *Guttigera* Diakonoff, 1955, established to receive two New Guinean species, may also be referable to the Oecophyllembiinae on the basis of the hind wing venation.

The subfamily Oecophyllembiinae redefined here is a small group containing the following genera: *Metriochroa* (= *Oecophyllembius*), *Cryphiomystis*, *Guttigera*, *Prophyllonistis* and a new genus described in this paper. All the known species including new ones are listed in Appendix I at the end of this paper.

As mentioned above, the leaf-mines of oecophyllembiine species are very similar to each other and also to those of the phyllocnistine species, being narrowly linear, subepidermal, usually irregularly wandering, and having an ellipsoidal pupal chamber at the end of mines. By this pattern of leaf-mines, the Oecophyllembiinae may be impossible to be distinguished from the Phyllocnistinae. On the other hand, the adults emerged from

these mines are at once able to discriminate between the Oecophyllembiinae and Phyllocnistinae by the resting posture and fore wing pigmentation. In the Oecophyllembiinae, moths are usually pigmented with dark brown to blackish in ground colour; and in resting posture the anterior part of the body is raised at a steep angle as in most species of the Gracillariinae, with the fore and mid legs stepped ventrolaterally and the hind legs posteriorly in parallel with the abdomen. In the Phyllocnistinae, on the other hand, moths are usually whitish, silvery or golden-whitish in ground colour; and in resting posture the body is kept in parallel to the surface.

This paper deals with four species of the new genus *Eumetriochoa*, two of *Metriochoa* and two of *Cryphiomystis* occurring in Japan. All the species are new to science. Most part of the specimens including all the holotypes are deposited in the collection of the Hokkaido University.

SUBFAMILY OECOPHYLLEMBIINAE

Oecophyllembiinae Réal & Balachowsky, 1966, Ent. Appl. Agr. 2 (Lep. 1): 333.
Type-genus. *Oecophyllembius* Silvestri, 1908 (= *Metriochoa* Busck, 1900).

As mentioned in Introduction, this subfamily is not so well defined still now, that the redescription is given below.

Redescription. Adult, ♂ ♀. Tiny moths less than 10 mm in wing expanse, sometimes about 5 mm in most species of *Cryphiomystis*; in resting posture anterior part of body raised at a steep angle, with fore and mid legs stepped ventrolaterally and hind legs posteriorly in parallel with abdomen as in most species of Gracillariinae. Head covered with depressed scales, without ocelli; proboscis moderately developed. Maxillary palpus very minute, or absent in *Prophyllocnistis* and *Eumetriochoa* (gen. nov.), when present, it is one-segmented, porrect and pointed. Labial palpus moderate or short, three-segmented, drooping, rarely porrect or upcurved, smooth-scaled or rarely rough-scaled below on second segment alone; terminal segment about as long as the second. Antenna more or less as long as fore wing, simple in both sexes; scape slightly thickened, with a hairy or rarely scaly pecten, which is absent in *Cryphiomystis*. Legs rather long, smooth-scaled; in some species of *Eumetriochoa* hind tibia with a row of raised bristly scales above as in most species of the *Acrocercops*-group of Gracillariinae.

Fore wing elongate, lanceolate, pointed; discal cell long, occupying about basal four-fifths of wing, with its upper vein (Rs) weakened basally; 12- to 9-veined; vein R₁ present in *Eumetriochoa* and absent in other genera; R₂ and R₃ remote; R₅ reaching costal margin, and long-stalked with M₁ except in *Guttigera* and *Prophyllocnistis*; CuA₁, CuA₂ and M₃ absent in *Cryphiomystis*. Hind wing linear, long-pointed, with cell opened between M₂ and M₃; four to seven long bristly scales arranged along subcostal vein in a row on upper side of wing, usually pointing obliquely downwardly; 7-veined, with CuA₂ absent; Rs approaching to and running in parallel with Sc at its basal part as in Gracillariinae; M₁ always stalked with Rs; M₂ approaching to Rs in its middle, but not stalked with the latter; M₃ long-stalked with CuA.

Male genitalia: Tegumen membranous, simple, with uncus and gnathos absent; tuba analis well developed, sparsely setose laterally and densely setose apically, with an elongate subscaphium. Vinculum with a prolonged saccus. Valva elongate, covered with plumose setae in *Eumetriochoa*, partite scales in *Metriochoa* and *Guttigera*, and normal setae in

Cryphiomystis. Aedeagus elongately cylindrical, with or without cornutus on vesica. Eighth abdominal segment small, weakly sclerotized, glabrous or very sparsely squamose, without coremata. Seventh segment normal in structure as in preceding segments.

Female genitalia: Papilla analis moderate in length, more or less united with each other dorsally, covered with setae as usual; apophysis posterioris slender, widened at base. Eighth abdominal segment moderately or strongly sclerotized, rather short, glabrous, with a pair of slender apophyses anteriores. Ostium bursae opened on ventrum of intersegment between eighth and seventh abdominal segments, with or without genital plate; antrum usually present at base of ductus bursae, which is rather short, membranous or rarely partly sclerotized; corpus bursae large, membranous, with or without signum, which is, when present, a blade-like or thorn-shaped invagination with a subtriangular or round basal plate. Seventh abdominal segment usually not deformed into genital organs.

Larva. The larvae of three species of *Eumetriochroa* (gen. nov.), *E. hederæ* (sp. nov.), *E. miyatai* (sp. nov.) and *E. hiranoi* (sp. nov.), one species of *Metriochroa*, *M. syringæ* (sp. nov.), one species of *Cryphiomystis*, *C. sunosei* (sp. nov.), are available to the present study. This subfamily is probably characterized by the following characters of spinning larvae:—

Several sap-feeding instars followed by one or two spinning instars before pupal stage as in *Cameraria* of Lithocolletinae. Mouth parts atrophied except for spinneret as in last instar of *Phyllocnistis*. Thoracic legs reduced into papillate protuberances, with claw absent. Abdominal prolegs found on third to sixth segments in *Eumetriochroa* and *Metriochroa*, and on second to sixth or seventh in *Cryphiomystis*, but always reduced into a transverse glabrous plate, without crochets; according to Davis (1994), reduced abdominal prolegs placed on third to sixth in *Prophyllonistis* and second to sixth in the type-species of *Metriochroa*, and in the former genus the prolegs having a transverse row of uniordinal crochets; anal proleg invisible. Prothoracic and anal dorsal shields not developed. Thoracic spiracles opened at anterolateral areas of mesothorax. In body chaetotaxy, supposed MV-group of proprioceptor represented by MV2 and MV3 on all thoracic segments (at least MV3 of them being absent in the other subfamilies); L-group of abdominal segments unisetose (L1 in *Eumetriochroa*) or bisetose (L1 and L2 in *Metriochroa* and *Cryphiomystis*); SV-group on second to sixth abdominal segments bisetose (SV1 and SV2), arranged in a vertical line anterior to ventral glabrous plates (reduced prolegs); ninth abdominal segment with two or three pairs of tactile setae.

Leaf-mine. Leaf-mines of the members of this subfamily are, so far as known, very similar to those of *Phyllocnistis*.

A very long, tortuous, linear mine occurring on upper side (or lower side in *Metriochroa syringæ*) of food plant leaves, subepidermal in most cases, with or without a brownish or blackish central line of frass. Pupation occurring inside a pupal chamber made in mine at the end, the pupal chamber being ellipsoidal, strongly lined with silken threads, with a swollen lower side and a wrinkled upper side.

Remarks. This subfamily is characterized, thus distinguished from the other subfamilies, by the long-stalked veins Rs and M₁ in the hind wing, by the presence of bristly scales along the subcostal vein of upper side of hind wing, by the larval thoracic spiracles opened on the mesothorax instead of prothorax, and by the presence of two proprioceptors MV2 and MV3 on all thoracic segments in spinning larval instars.

So far as I am aware, it is well recognized that the thoracic spiracles are situated near the posterior margin of the prothorax in lepidopterous larvae (Stehr, 1987; Scoble, 1992).

In the larvae of this subfamily, though I have examined the larvae of eight species belonging to three genera, the thoracic spiracles are curiously not found on the prothorax, but on lateral sides near the anterior margin of the mesothorax in both the spinning and sap-feeding morphs (see Figs. 16–20). These spiracles found on the mesothorax may be homologous to those on the prothorax in the other lepidopterous larvae, because the prothoracic spiracles of lepidopterous larvae are thought to be derived from the mesothorax (Scoble, 1992). Anyhow, the larval thoracic spiracles opened on the mesothorax seem to be a unique character to the subfamily Oecophyllembiinae in the order Lepidoptera.

Although our knowledges on the larval chaetotactic pattern of Gracillariidae are still fragmentary, the supposed proprioceptors MV2 and MV3 of the thoracic segments are, so far, only seen in the larvae of the present subfamily among the gracillariid larvae. The presence of MV2 and MV3 on the prothorax, MV1, MV2 and MV3 on the mesothorax and metathorax, and MV3 on all abdominal segments is a basic pattern of the larval body chaetotaxy in the Lepidoptera (Hinton, 1946; Stehr, 1987). The loss of one or two of these setae in the Gracillariinae and Lithocolletinae seems to indicate that these groups are specialized as to this character state. The occurrence of MV2 and MV3 on the thoracic segments in Oecophyllembiinae is probably atavistic, because the larval transformation and much reduced chaetotactic pattern except for MV-group suggest that the subfamily is an advanced group in the Gracillariidae.

In adult hind wing venation, the long-stalked condition of the veins Rs and M₁ is also peculiar to this subfamily. On the other hand, the fact that the vein Rs basally approaches to the vein Sc and runs in parallel with the latter at the basal part suggests that it is nearer to Gracillariinae than to Lithocolletinae.

The long bristly scales occurring on the upper side of the hind wing along subcostal vein are probably a secondary pseudofrenulum reported in *Neurostrotia gunniella* (Busck, 1906) by Davis et al. (1991) and figured in some other species of the subfamily Gracillariinae by Kumata (1989; 1992). Bristles of the pseudofrenulum of the Gracillariinae are, however, usually stretched oblique-upwardly from the end of the subcostal vein. In the subfamily Oecophyllembiinae the bristly scales of pseudofrenulum are arranged on the subcostal vein in a row, and are stretched oblique-downwardly. The secondary pseudofrenulum is not reported from the subfamilies Lithocolletinae and Phyllocnistinae.

In contrary to these peculiar adult and larval morphological characters, the larval leaf-mines of the Oecophyllembiinae are very similar to those of the genus *Phyllocnistis*, and are very different from those of the Gracillariinae and Lithocolletinae, especially in shape of the pupal chamber made at the end of the leaf-mine. Mainly based on this character, Davis (1994) transferred the genera *Metriochroa*, *Cryphiomystis* and his new genus *Prophylllocnistis* to the subfamily Phyllocnistinae together with the genus *Phyllocnistis*. The subfamily Phyllocnistinae has been treated for long times as an independent family including the genus *Phyllocnistis* alone, but recently it is transferred to the family Gracillariidae in providing the hypermetamorphosis in common: early sap-feeding instars and late tissue-feeding or spinning instars (Davis, 1983, 1987; Common, 1990). The genera treated in this paper are, however, essentially different from the genus *Phyllocnistis* by the venation of the hind wing and by the opening situation of the larval thoracic spiracles. In *Phyllocnistis* the vein M₁ of the hind wing is connate with the vein M₂, and the common stem of the veins M₁₊₂ and M₃ is stalked with the vein CuA (see Fig. 15(E)). The thoracic spiracles of the larvae of *Phyllocnistis* are situated at the posterolateral areas of the prothorax as usual (see Fig. 21(C, D)). Larval body setae of *Phyllocnistis* are, so far examined,

extremely rudimentary, and sometimes invisible in both the early sap-feeding and the late spinning instars. Therefore, *Phyllocnistis* could not compare with other genera by the larval chaetotaxy. Anyhow the genera *Metriochoa*, *Cryphiomystis* and *Prophyllonistis* might be excluded from the subfamily Phyllocnistinae.

KEY TO THE GENERA OF THE SUBFAMILY OECOPHYLLEMBIINAE

(**Guttigera* and *Prophyllonistis* not treated in this paper)

1. Fore wing with vein R₅ long-stalked with M₁. 2
- Fore wing with radial and median veins arising separately from cell 4
2. Fore wing with vein R₁ present; maxillary palpus absent; male valva densely covered with plumose setae. *Eumetriochoa* gen. nov.
- Fore wing with vein R₁ absent; maxillary palpus present; male valva covered with partite scales or normal slender setae. 3
3. Fore wing with vein CuA₂ absent; valva partly covered with partite scales besides normal slender setae. *Metriochoa* Busck
- Fore wing with veins M₃, CuA₁ and CuA₂ absent; valva covered with normal slender setae alone. *Cryphiomystis* Meyrick
4. Fore wing with three radial veins on costa (perhaps R₂, R₃ and R₄); hind wing with vein M₃ stalked with CuA. **Guttigera* Diakonoff
- Fore wing with four radial veins (perhaps R₂, R₃, R₄ and R₅); hind wing with vein M₃ absent. **Prophyllonistis* Davis

GENUS EUMETRIOCHROA NOV.

Type-species. *Eumetriochoa hederæ* sp. nov.

Etymology. *Eumetriochoa* (G.) = eu (original, primitive) + metrios (moderate, temperate) + chroa (skin, colour of skin); feminine.

Description. Adult, ♂ ♀. Face and vertex smooth-scaled, with neckplumes appressed; ocelli absent; proboscis developed. Labial palpus short, drooping or porrect, very slightly upcurved, smooth-scaled or slightly tufted below in the second segment in *E. hederæ*. Maxillary palpus absent. Antenna simple, as long as or slightly shorter than fore wing; scape slightly thickened, with a more or less thick scaly pecten in *E. hederæ* or a minute hairy pecten in other species. Legs moderately long, smooth-scaled; hind tibia with a row of bristly scales above only in *E. hederæ* as in most species of *Acrocercops*-group; anterior pair of spurs of hind tibia arising from basal third; hind tarsus a little longer than hind tibia.

Fore wing elongate, lanceolate, pointed apically; discal cell long, reaching about basal four-fifths of wing, bluntly angulated apically, with upper veins weakened basally; 12- or rarely 11-veined, with CuA₂ always absent and R₅ very weakened or absent in *E. miyatai*; R₁ arising from basal 1/3 of cell, R₂ remote from R₃; R₄ basally connate or short-stalked with M₁; R₅, when present, long-stalked with M₁; 1A+2A nearly straight, connected with dorsal margin a little before middle of wing. Hind wing very narrow, about half as wide as fore wing, a little longer than discal cell of fore wing, long-pointed, with cell opened between M₂ and M₃; six-veined, with CuA₁ absent; Rs upcurved basally and approaching to Sc; M₁ stalked with Rs; M₂ approaching to Rs, but not stalked with it; M₃ stalked with CuA; cilia very long.

Male genitalia: Tegumen elongate, membranous, squamose dorsally, sparsely setose

laterally near base; tuba analis conical or cylindrical, slightly produced beyond tegumen, moderately or thickly setose around apex, with a weakly sclerotized, slender subscaphium. Vinculum lengthened, round or angulated laterally, with apical saccus moderate or long. Anellus conical, membranous or very weakly sclerotized, with or without ventral juxta. Valva elongate, pointed apically, with a short projection or a wide lobe in disc; dense plumose setae occurring on inner surface of valva; transtilla incomplete. Aedeagus narrowly tubular, usually longer than valva, obliquely truncate apically, with tubular, plate-like or bar-shaped cornutus on vesica. Eighth abdominal segment comparatively small, weakly sclerotized, glabrous or very sparsely squamose dorsally, without coremata.

Female genitalia: Papillae anales moderate in length, dorsally united with each other, covered with slender setae rather densely; apophysis posterioris moderate in length, slender, but widened at base. Sclerotized part of eighth abdominal segment short, separated ventrally; apophysis anterioris moderate in length, slender, but widened at base, more or less as long as apophysis posterioris. Ostium bursae opening in intersegment between eighth and seventh abdominal segments, but usually nearer to the latter segment; sclerous genital plate absent or rarely represented by a weakly sclerotized conical chamber in *E. hiranoi*. Antrum usually present, moderately cylindrical or shortly ring-shaped; in *E. miyatai* it is absent. Ductus bursae moderate to long, membranous; corpus bursae comparatively small, membranous, with a single blade-like, invaginated signum, which has a subtriangular basal plate. Seventh abdominal segment normal in structure or slightly deformed in sternite alone.

Larva. So far as the larvae of three species, *E. hederæ*, *E. miyatai* and *E. hiranoi*, are concerned, there are two spinning instars following the sap-feeding stage, instar-numbers of which are not yet determined. Body chaetotaxy of the second spinning (last) instar is considerably different among these species in number and situation as described under each species and as figured in Fig. 22. However, the following points are shared by the species and are probably characteristic to this genus.

Prothorax without sclerous dorsal shield and spiracles; tactile setae XD2, L3 and SV2 absent; supposed proprioceptors MV2 and MV3 present. Mesothorax with a pair of spiracles near anterior margin; seta L3 absent; proprioceptor MV1 absent, and MV2 and MV3 present. Metathorax similar to mesothorax except for absence of spiracles. In abdominal segments, seta D1 longer than D2 in *E. miyatai* and *E. hiranoi*; L-group unisetose on all segments; SV-group bisetose on second to sixth segments and unisetose on first, seventh and eighth segments; ninth segment with three pairs of tactile setae (probably D1, D2 and SV1) and one pair of proprioceptors (MD1); tenth segment without sclerous dorsal shield, but with three pairs of setae (D1, D2 and SD1) on dorsum. Abdominal prolegs seen on third to sixth segments, but very reduced into ventral protuberances, without crochets; anal prolegs imperceptible.

Remarks. This new genus is closely related to the genus *Metriochoera* in hind wing venation and in female genital structures, but is distinguished from the latter by the presence of vein R₁ in fore wing, by the absence of maxillary palpus, by the elongated and apically pointed valva covered on the inner side with plumose setae instead of partite scales, and by the aedeagus with a cornutus on vesica and without a flap-like plate fixed dorsally.

The members of this genus are leaf-miners on Araliaceae, Aquifoliaceae or Styracaceae. The mine is very long, narrowly linear, irregularly tortuous, and occurs on the upper side of leaves. Pupation takes place inside the broadened termination of the mine within an ellipsoidal pupal chamber, which is very similar to that of the members of the genus *Phyllocnistis*.

KEY TO THE SPECIES OF THE GENUS EUMETRIOCHROA

1. Antennal scape with a large scaly pecten; hind tibia with a row of bristly raised scales above; valva without a thorn-like apical seta; aedeagus with a long (about half as long as aedeagus) cornutus having three or four transverse denticules; female seventh sternite trapeziform, with lateral glabrous areas; leaf-miner on *Hedera*. *E. hederæ* sp. nov.
- Antennal scape with a small hairy pecten; hind tibia smooth-scaled, without such scales above; valva with a thorn-like apical seta; aedeagus with other types of cornutus or cornuti; female seventh abdominal sternite normal in structures. 2
2. Face and vertex grayish to fuscous; fore wing grayish ochre, mixed with dark brown and grayish white irroration, with five or six whitish to ochreous fasciae and three costal spots, or with a series of ochre whitish costal and dorsal spots; leaf miner on *Kalopanax*. *E. kalopanacis* sp. nov. (autumnal form)
- Face and vertex white; fore wing more or less fasciated with white and ochreous brown in alternation. 3
3. Valva with a pyramid-shaped projection in centre of disc; aedeagus with a small plate-like apical cornutus and a minute corniform one behind it; female corpus bursae reversely bent near apex; leaf-miner on *Kalopanax*. *E. kalopanacis* sp. nov. (aestival form)
- Valva with a round or wide-triangular lobe in disc; aedeagus with a plate-like or cylindrical, elongate cornutus near centre; female corpus bursae straight, not bent near apex; leaf-miner on other plants. 4
4. Valva with a widely triangular lobe extending in disc from basal fourth to apical third; ostium bursae membranous, without antrum and genital plate; ductus bursae wholly membranous, not lined with spines; signum with a small triangular basal plate; leaf-miner on *Ilex*. *E. miyatai* sp. nov.
- Valva with a large, round lobe extending in disc from middle to apical fourth; ostium bursae surrounded by weakly sclerotized conical tube, which is produced caudad; antrum short and cylindrical; ductus bursae lined with spines near middle where it is slightly widened; signum with a laterally prolonged basal plate; leaf-miner on *Styrax*. *E. hiranoi* sp. nov.

Eumetriochoa hederæ sp. nov.

[Figs.1, 2(A), 12(A, B), 14(A), 17, 18(A), 22(A), 24(A, B)]

Adult. ♂ & ♀ .

Measurement. Expanse of wings: 8.1 – 9.7 mm (8.5 mm in holotype). Length of fore wing: 3.8 – 4.6 mm (4.0 mm in holotype).

Description. Face and vertex white. Labial palpus whitish; second segment slightly thickened below apically and infuscated laterally; apical segment with a fuscous median spot below. Antenna a little longer than fore wing, pale grayish, faintly annulated with darker colour; scape and its scaly pecten white, with a blackish apical ring. Thorax white, with tegulae ochreous anteriorly. Legs whitish; fore coxa medianly and apically, femur and tibia laterally, and each segment of tarsus apically fuscous or blackish; mid femur subbasally and subapically and tibia subbasally, medianly and apically spotted with fuscous, the apical spot of tibia usually forming a rather broad ring; hind coxa, femur and tibia with a fuscous apical blotch; mid and hind tarsi with four blackish rings; hind tibia with a pair of bristly scales on upper side as in most species of *Acrocercops*-group. Abdomen dark fuscous dorsally and whitish ventrally, with each segment having a fuscous transverse anterior band, which is widened laterally.

Fore wing ochre brownish in ground colour, with five obliquely transverse whitish

fasciae arranged nearly equidistantly from basal fifth to subapex; basal three fasciae usually widened towards dorsum, sometimes intercalated by an irregular row of ochreous to fuscous spots or a narrow line in centre, the last two of them being confluent to one another through a whitish streak on wing fold in some specimens; fourth fascia narrowing towards termen and sometimes detached from it; fifth fascia at subapex vertical or slightly oblique inwardly, wedge-shaped; a very minute white spot placed at base above wing fold; in a few specimens an irregular fascia of whitish irrorations placed at subbase; all these white marks usually margined with darker irroration, especially remarkably around apex of fourth fascia; cilia around wing apex and termen ochreous in basal half and whitish in apical half, with median and apical fringe lines of blackish irroration; cilia along dorsal margin pale grayish. Hind wing dark gray, with cilia grayish.

Male genitalia (Fig. 1): Tegumen subconical, with basal setae sparse; tuba analis with apical setae rather sparse; subscaphium slender, slightly widened basally. Valva about as long as tegumen, elongate, slightly widened medianly, with an acute, hook-like apex; a short projection projected near base of valva, flat, round apically; plumose setae densely occurring on inner surface and normal filiform setae scattered along costal and ventral

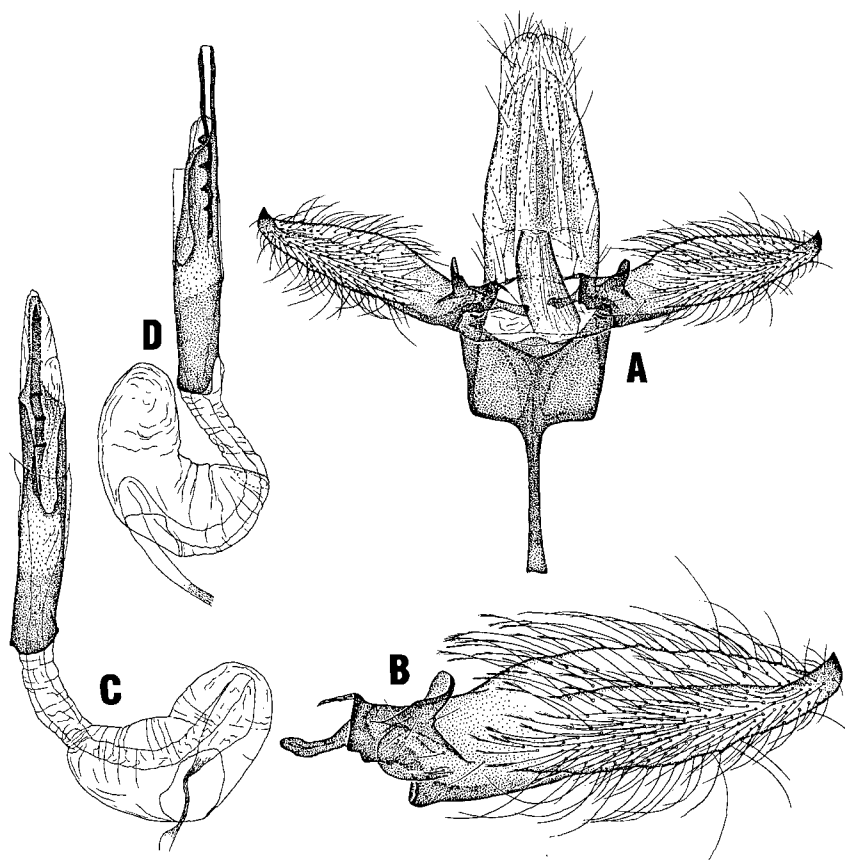


Fig. 1. *Eumetriochoera hederae* sp. nov. A: Male genitalia in ventral view, aedeagus omitted [paratype, Gen. sl. no. Grc-5049] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Ditto [holotype, Gen. sl. no. Grc-5109].

margins; a group of shorter setae placed below basal projection. Vinculum elongate, angulated laterally, with saccus slender, long, 1.5 – 1.8 times as long as vinculum at ventrum. Aedeagus about 1.5 times as long as valva, conspicuously narrowed on apical fourth; vesica scattered with spinules, with a slender, long cornutus, which is about half as long as aedeagus and has three or four transverse denticles. (Six slides examined.)

Female genitalia (Fig. 2(A)): Papilla analis densely setose as usual, sparsely spinulose along caudal margin alone; apophysis posterioris slender, widened basally, about as long as apophysis anterioris. Ostium bursae without sclerous genital plate; antrum moderately long, tubular; ductus bursae long, thick; corpus bursae rather small, a little thicker than ductus bursae; a single signum thorn-like, covered by spines, with a basal plate small and subtriangular. Seventh abdominal sternite trapeziform, much narrowed caudad, with glabrous lateral areas. (Five slides examined.)

Larva. Body chaetotaxy of last (second spinning) instar (Fig. 22(A)): Prothorax without dorsal shield and spiracles, but with a pair of ventral protuberances which may be reduced prothoracic legs; setae XD2, L3 and SV2 absent, D2, SD1 and L1 nearly equal in length and longest among setae, V1 shortest; supposed proprioceptors MV2 and MV3 prominent around ventral protuberance, the MV2 placed cephalad of it and MV3 below. Mesothorax having a pair of spiracles near anterior margin; seta L3 absent, D2 and SD1 shorter than D1 and SD2, respectively; MV2 and MV3 around ventral protuberances as in prothorax. Metathorax with chaetotaxy very similar to that on mesothorax except for absence of spiracles. First to eighth abdominal segments with setae L2, L3 and SV3 absent; moreover, first, seventh and eighth segments with SV2 absent and sometimes SV1 invisible. Ninth segment with three tactile setae (probably D1, D2 and L1) and one proprioceptor (MD1) on each side. Tenth segment without anal shield, but with three pairs of setae on dorsum, they are probably D1, D2 and SD1, the D2 being very long and more than four times length of D1. Abdominal prolegs present on third to sixth segments, reduced into ventral protuberances; anal prolegs imperceptible.

Specimens examined. Adult: 100♂ & 86♀. Holotype: ♂, Sakurazaka, Hukuoka-si, Hukuoka-ken, Kyusyu, em. 17/iv/1987 (Y. Koto), ex *Hedera rhombea* (2908), Gen. sl. no. Grc-5109, deposited in Hokkaido University. Paratypes: HONSYU — 3♂ & 3♀, Akigase, Urawa-si, Saitama-ken, em. 26–27/iv/1993 (Y. Sakamaki), ex *H. rhombea*; 17♂ & 14♀, Odawara, Kanagawa-ken, em. 22/iv – 10/v/1974 (T. Miyata), ex *H. rhombea* (1266); 3♂ & 1♀, Kamigo, Yokohama-si, Kanagawa-ken, em. 21–26/iv/1995 (T. Kumata), ex *H. rhombea* (5295); 10♂ & 10♀, Sanan, Tita-si, Aiti-ken, em. 20–23/iv/1979 (Y. Arita), ex *H. rhombea*; 16♂ & 14♀, Kuki-toge, Owase-si, Mie-ken, em. 6–10/v/1980 (M. Yamashita), ex *H. rhombea*; 1♂, Kozagawa, Wakayama-ken, 14–20/v/1964 (T. Kumata); 4♀, same locality, em. 22–23/v/1970 (T. Kumata), ex *H. rhombea* (1023); 14♂ & 12♀, Kyoto, em. 26/v/1966 (H. Takada), ex *H. rhombea*; 2♂, Nose, Osaka, em. 20/v/1957 (T. Kodama), ex *H. rhombea*; 2♀, Izumikaturagi-san, Osaka, em. 8/v/1961 (T. Saito), ex *H. rhombea*. SIKOKU — 1♂ & 1♀, Tairyuzi, Anan-si, Tokushima-ken, em. 10/iv/1992 (T. Kumata), ex *H. rhombea*; 2♂ & 1♀, Matuyama, Ehime-ken, em. 6–7/v/1957 (T. Tatikawa), ex *H. rhombea*; 1♀, Kanmon, Omogokei, Ehime-ken, em. 15/v/1953 (T. Yano), ex *H. rhombea*. KYUSYU — 2♂ & 1♀, Hukuoka, em. 18/iv/1967 (M. Suwa), ex *H. rhombea*; 19♂ & 13♀, same data as holotype, em. 16–24/iv/1987; 1♂ & 1♀, Hikosan (alt. 700 m), Hukuoka-ken, em. 9–11/v/1979 (I. Kanazawa), ex *H. rhombea*; 9♂ & 8♀, same locality, em. 22/iv–1/v/1996 (K. Sugisima), ex *H. rhombea*.

Larva: 5 exs. of last (second spinning) instar and 3 of penultimate (first spinning) instar, all mounted on slides, Odawara, Kanagawa-ken, Honsyu, 27/iii/1974 (T. Miyata), ex *Hedera rhombea* (1266); 4 exs. of last (second spinning) instar and 2 exs. of last sap-feeding instar, all mounted on slides, Kamigo, Yokohama-si, Kanagawa-ken, 23/iii/1995 (T. Kumata), ex *H. rhombea* (5294); 1 ex. of last (second spinning) instar mounted on slide, Kozagawa, Wakayama-ken, 21/v/1970 (T. Kumata),

ex *H. rhombea* (1023).

Distribution. Japan (Honsyu; Sikoku; Kyusyu).

Food plant. *Hedera rhombea* (Miq.) Bean (Araliaceae).

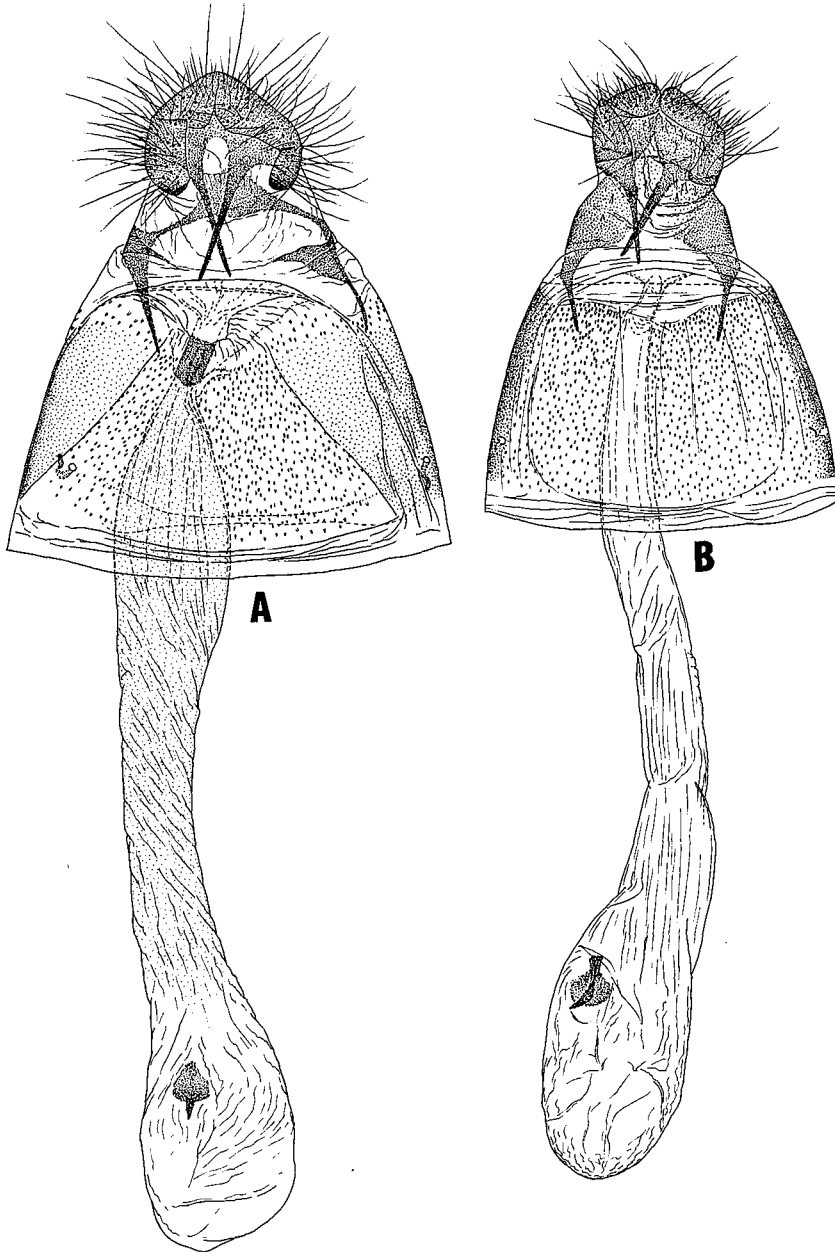


Fig. 2. A: *Eumetriochroa hederae* sp. nov., female genitalia in ventral view [paratype, Gen. sl. no. Grc-5052].

B: *Eumetriochroa miyatai* sp. nov., female genitalia in ventral view [paratype, Gen. sl. no. Grc-3857].

Biology. This species is a leaf-miner throughout its larval stage. The mine (Fig. 24(A)) is at first a small irregular blotch occurring on the upper side of leaf, and is purple brown in colour. This stage of the mines was found in the autumn from October to November in Honsyu. In the next early spring, end of March, the mine (Fig. 24(B)) is grown into a very long irregular serpentine type, which is stretched from the blotchy part found in the last autumn, and is 15 – 20 cm in length and 3 – 4 mm in width. At this time most larvae made a pupal chamber within the end of the mine. The pupal chamber is elliptical, with a swollen under side and wrinkled upper side as in most species of the genus *Phyllocnistis*.

Field observations and rearing records suggest that this species overwinters in the larval stage and grows during winter season within the evergreen leaf of the food plant. Adults fly in spring from late April to June. Up to now the summer generation is not known.

Remarks. This new species is easily distinguished from the other members of *Eumetriochoera* by the thickly scaly pecten of the antennal scape, by the hind tibia with a row of bristly scales above, by the peculiar cornutus of the aedeagus in male, and by the trapeziform seventh abdominal sternite with lateral glabrous areas in female.

Eumetriochoera miyatai sp. nov.

[Figs.2(B), 3, 12(C, D), 14(B), 18(B–D), 22(B), 24(C–E)]

Adult. ♂ & ♀.

There are two seasonal forms in size and colour: one is a vernal form emerged from overwintered larvae in spring from April to July, and the other is an aestival form emerged in summer from July to early September.

Measurement. Vernal form: Expanse of wings, 6.1 – 9.0 mm (8.7 mm in holotype; 7.81 mm on average, n=16); length of fore wing, 2.8 – 4.4 mm (4.2 mm in holotype; 3.68 mm on average, n=16). Aestival form: Expanse of wings, 5.7 – 6.9 mm (6.14 mm on average, n=8); length of fore wing, 2.7 – 3.2 mm (2.83 mm on average, n=8).

Description. Vernal form including holotype: Face and vertex white. Labial palpus whitish; second segment smooth-scaled, with a fuscous, broad apical ring; apical segment with a fuscous, narrower median ring. Antenna a little longer than fore wing, whitish, annulated with ochre-brown narrowly; scape and its hairy pecten white. Thorax white, with an ochreous median stripe in some specimens; tegulae white, ochreous anteriorly. Legs whitish; fore coxa medianly blackish, femur and tibia wholly blackish, and tarsus with four narrow blackish rings; mid femur with three fuscous spots at base, in middle and at apex, tibia with similar spots at subbase, in middle and at apex (usually the latter two spots forming broad rings), and tarsus with three narrow blackish rings; hind coxa and tibia apically and femur medianly spotted with black, and tarsus with four narrow blackish rings; hind tibia without any bristly scale. Abdomen dorsally dark grayish, ventrally whitish, with a dark transverse band seen obscurely in anterior three or four segments.

Fore wing ochreous brown in ground colour, with very variable white marks, which are sometimes different between right and left wings; the white marks basically consisting of five oblique fasciae arranged equidistantly from basal fifth to subapex, five costal spots placed in interspaces between fasciae, and a basal stripe on dorsal margin; basal three fasciae much widened towards dorsum, and sometimes divided by ground colour into a reversed Y-shape; fifth fascia at subapex vertical, irregularly margined with fuscous irroration on both sides, the outer irroration sometimes forming an apical spot; stripe on dorsum usually confluent to first fascia at its apex; in some specimens including holotype these

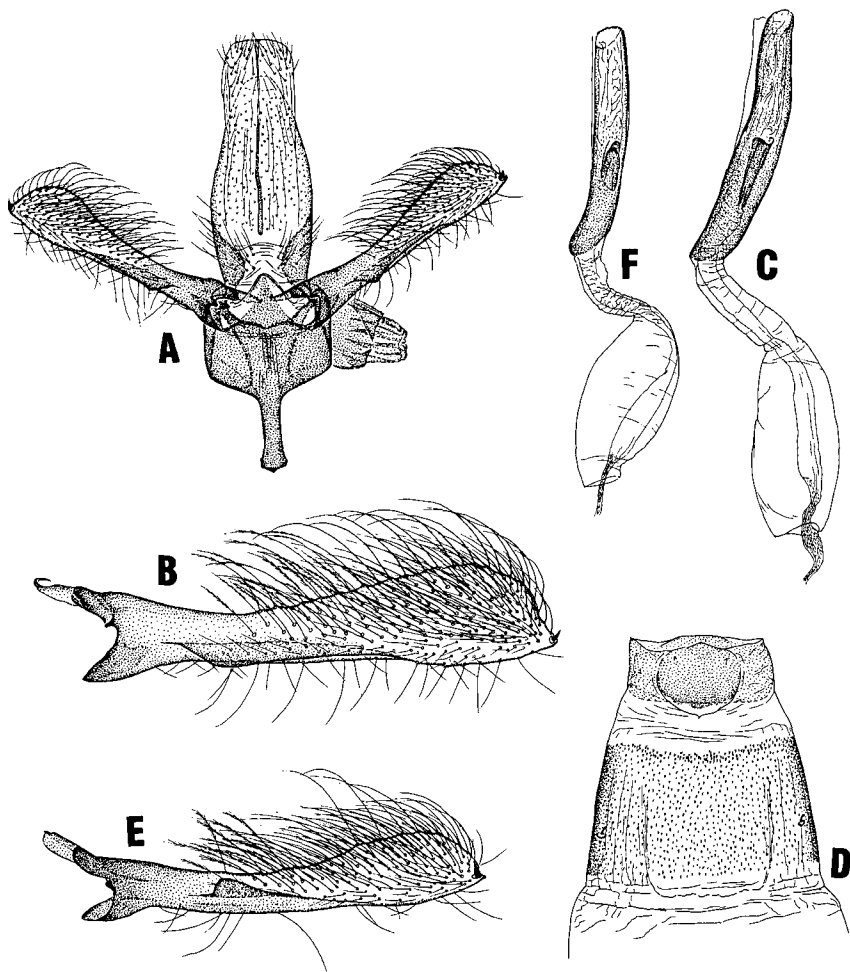


Fig. 3. *Eumetriochroa miyatai* sp. nov. A: Male genitalia in ventral view, aedeagus omitted [holotype, Gen. sl. no. Grc-3859] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Seventh and eighth abdominal segments in ventral view [ditto] — E: Right valva [paratype, Gen. sl. no. Grc-5047] — F: Aedeagus [paratype, Gen. sl. no. Grc-1818].

white marks interrupted by ground colour into white dots, which are usually circular and irregularly scattered in disc, but fourth fascia near apex always maintaining a fasciate condition; cilia at apex of wing ochreous basally and white apically, with a blackish vertical median fringe line; cilia along termen ochreous, dashed with white at white marks, with two blackish fringe lines convergent towards wing apex; cilia along dorsal margin whitish. Hind wing and its cilia gray.

Aestival form: Differs from the vernal form in colour of fore wing as follows: — Basal three white fasciae much widened, sometimes wider than ochreous interspaces between them, each of them confluent to a costal spot placed distad of it, with an ochreous dot on

costa; first fascia expanding towards base, and almost occupying basal fourth of wing, but usually leaving a small ochreous area on costa or two costal dots; a white costal spot between fourth and fifth fasciae usually extending towards middle of termen to form an additional fascia; cilia white, with blackish fringe lines similar to those of vernal form.

Male genitalia (Fig. 3): Tegumen spatulate in ventral view, with a pair of sparsely setose lateral areas at base; tuba analis cylindrical, with dense apical setae and a narrow subscaphium. Valva elongate, more or less constricted near base; costal margin strongly convex near apex; apex obtuse, with a thorn-like short seta; ventral margin with a wide-triangular lobe; plumose setae densely occurring on apical two-third of inner surface, and slender setae sparsely along costal and ventral margins. Vinculum moderately long, round on lateral margins, with saccus about as long as vinculum; weakly sclerotized juxta acute-triangular. Aedeagus about 1.2 times as long as valva, tubular, truncated apically; vesica with a weakly sclerotized, oblong, plate-like cornutus, which is one-fourth to one-fifth as long as aedeagus. Eighth abdominal segment completely glabrous, but not deformed. (Fourteen slides examined.)

Female genitalia (Fig. 2(B)): Papilla analis very sparsely spinulose along caudal margin alone besides usual long setae; apophysis posterioris slender, widened at base, 1.2 – 1.4 times as long as apophysis anterioris. Ostium bursae membranous, without sclerous genital plate and antrum; ductus bursae rather long, about 2.5 times as long as seventh segment, membranous throughout; corpus bursae elongate-ellipsoidal; a single signum acutely thorn-like, with a basal plate subtriangular or subcircular and shortly produced caudally. Seventh abdominal segment normal in form as in preabdominal segments. (Ten slides examined.)

Larva. Body chaetotaxy of last (second spinning) instar (Fig. 22(B)): All thoracic legs and abdominal prolegs reduced into paired protuberances, without claw and crochets, the prolegs occurring on third to sixth abdominal segments; thoracic spiracles situated on mesothorax as in *E. hederæ*. Body chaetotaxy also somewhat similar to that of *E. hederæ*, but different from it by the following points: — All setae much shorter than corresponding setae of *E. hederæ*; in mesothorax and metathorax seta D1 shorter than D2, and in metathorax SD2 absent; in first to eighth abdominal segments D1 slightly longer than and anterolateral to D2, and SD1 absent; in tenth abdominal segment D2 short and nearly as long as D1.

Specimens examined. Adult: 31 ♂ & 23 ♀. Holotype: ♂ (vernal form), Behu, Hukuoka-si, Hukuoka-ken, Kyusyu, em. 10/iv/1983 (Y. Koto), ex *Ilex rotundata*, Gen. sl. no. Grc-3859, deposited in Hokkaido University. Paratypes: Vernal form: HOKKAIDO — 3♂, Nopporo, em. 16–19/vi/1979 (T. Kumata), ex *Ilex crenata* (1813); 1♀, same locality, em. 15/vi/1983 (T. Kumata), ex *I. crenata*; 1♂ & 3♀, same locality, em. 15–24/vi/1987 (K. Kamijo), ex *I. crenata*. HONSHU — 12♂ & 2♀, Sengakuhara, Hakone, Kanagawa-ken, em. 27/iv–10/v/1974 (T. Miyata), ex *I. crenata*; 1♀, Gora, Hakone, em. 14/iv/1974 (T. Miyata), ex *I. crenata*; 2♀, Miura-hanto, Kanagawa-ken, 17/iv/1986 (V. O. Becker); 1♂ & 1♀, Sigakogen, Nagano-ken, em. 19/v/1959 (T. Kodama), ex *I. crenata*; 1♂, Ueno, Azusagawa-mura, Nagano-ken, 3/vi/1981 (N. Hirano); 2♂ & 2♀, Hikage-daira (alt. 1360 m), Gihu-ken, em. 14–15/v/1979 (Y. Arita), ex *I. crenata*; 1♂, same locality, 10–12/vi/1980 (T. Tanabe); 1♀, Rokusyo-san, Toyota, Aiti-ken, 4/vi/1976 (Y. Arita); 1♂, Matagutigawa, Owase, Mie-ken, 3/v/1980 (M. Yamashita). KYUSYU — 2♂ & 2♀, same data as holotype; 3♂ & 2♀, Sakurazaka, Hukuoka-si, Hukuoka-ken, em. 8/iv/1983 (Y. Koto), ex ? *Hedera rhombea*. Aestival form: HONSHU — 2♂, Ueno, Azusagawa-mura, Nagano-ken, 5/vii/1981 (N. Hirano); 1♂, same locality, em. 23/vii/1992 (N. Hirano), ex *Ilex* sp. (1039); 2♂ & 3♀, same locality, em. 20/viii–4/ix/1992 (N. Hirano), ex *Ilex* sp. (1056). Intermediate form: SIKOKU — 1♂, Asizuri-misaki, Koti-ken, em. 27/x/1980 (T. Kumata), ex *Ilex* sp.

Larva: 1 ex. of last (second spinning) instar, 2 exs. of penultimate (first spinning) instar, and 2

exs. of last sap-feeding instar, all mounted on slides, Sengakuhara, Hakone, Kanagawa-ken, Honsyu, 14/iv/1974 (T. Miyata), ex *Ilex crenata* (1269).

Distribution. Japan (Hokkaido; Honsyu; Sikoku; Kyusyu).

Food plants. *Ilex* spp. including *I. crenata* Thunb. and *I. rotundata* Thunb. (Aquifoliaceae).

Biology. At least there are two generations in a year. Adults emerged in spring from April to early June and in summer from July to early September, but one specimen unusually emerged in the end of October in Sikoku.

This species is an upper leaf-miner throughout its larval period. The mine (Fig. 24(C–E)) is whitish, narrowly linear, irregularly curved, but usually follows the margin of the previous gallery. Sometimes it occupies almost whole the surface of leaf, when it makes on a small leaf of food plants such as *Ilex crenata*. A pupal chamber is found at the end of the mine as in the preceding species, ellipsoidal, with a swollen lower side and a wrinkled upper side.

This species is overwintered in larval stage within evergreen leaves of food plants. I collected mines containing nearly full-grown sap-feeding larvae in early April just after the snowy season in Hokkaido.

Remarks. The vernal form of this species is somewhat similar to *E. hederæ* in colour pattern, but is distinguished from the latter by the absence of dark irroration around preapical white fascia in addition to the hairy pecten of the antennal scape and smooth-scaled hind tibia. In genital features of both sexes, it is more easily distinguished from *E. hederæ* by the shape of valva without a subbasal finger-shaped projection and with a thorn-like apical seta, by the shorter cornutus of the aedeagus, by the wholly membranous ductus bursae without sclerous antrum, and by the usual form of the female seventh abdominal sternite.

This species is dedicated to Mr. Tamotsu Miyata of Odawara, Honsyu, who kindly offered me many leaf-miners collected at the Hakone district.

Eumetriochoa kalopanacis sp. nov.

[Figs. 4, 5(A, B), 12(E, F), 14(C, D), 25(A, B)]

Adult. ♂ & ♀.

There are two seasonal forms in colour-pattern and size: one is an aestival form emerged or collected in Summer from July to August, and the other is an autumnal form emerged in autumn from mid September to October.

Measurement. Autumnal form: Expanse of wings, 6.4–7.2 mm (6.7 mm in holotype); length of fore wing, 3.0–3.4 mm (3.2 mm in holotype). Aestival form: Expanse of wings, 5.7 mm; length of fore wing, 2.7–2.9 mm.

Description. Autumnal form: Face and vertex grayish, densely mottled with fuscous in some specimens; in holotype they are wholly fuscous. Labial palpus grayish white, with second segment apically and apical segment medianly ringed with dark fuscous broadly. Antenna a little shorter than fore wing, grayish white, annulated with dark fuscous; scape dark fuscous, with a grayish hairy pecten. Thorax grayish white, densely irrorated with fuscous in some specimens; in holotype it is wholly dark fuscous. Legs whitish gray; fore coxa widely fuscous medianly, femur and tibia fuscous outside, and tarsus with four blackish rings, each of them placed at apex of the segment; mid tibia with two fuscous blotches in middle and at apex, and tarsus with four blackish rings; hind tibia faintly ringed with fuscous at apical extremity, slightly thickened apically, without bristly scales; hind tarsus with four

blackish broad rings. Abdomen blackish dorsally, grayish white ventrally, without transverse dark bands.

Fore wing narrower than the preceding two species; ground colour grayish ochre, irregularly mixed with dark brown and grayish white irroration throughout, further speckled with black on basal area and along dorsal margin; markings whitish and variable in form, but basically consisting of one basal spot, five or six fasciae and three costal spots, the each costal spot being placed in each interspace between first to fourth fasciae, but rather near to fascia basal to it; all fasciae sometimes reduced into costal and dorsal spots; in some specimens including holotype first two fasciae angulated outwardly and widely margined

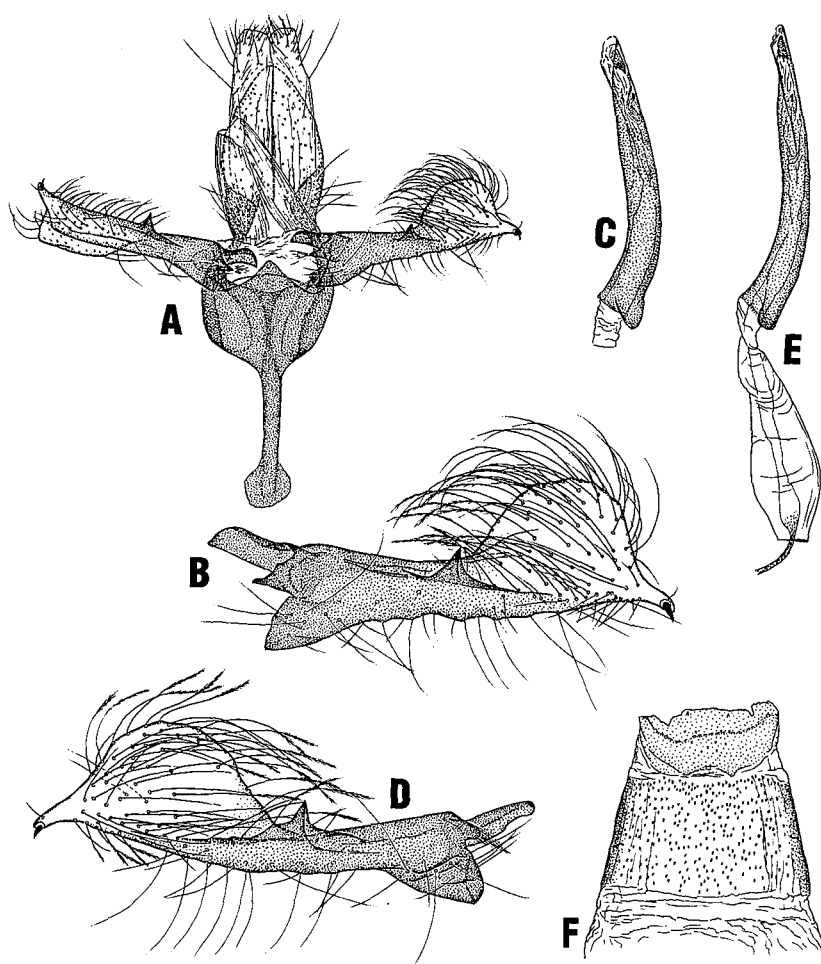


Fig. 4. *Eumetriochroa kalopanacis* sp. nov. A: Male genitalia in ventral view, aedeagus omitted [paratype, Gen. sl. no. Grc-5038] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Left valva [holotype, Gen. sl. no. 5037] — E: Aedeagus [ditto] — F: Seventh and eighth abdominal segments in ventral view [ditto].

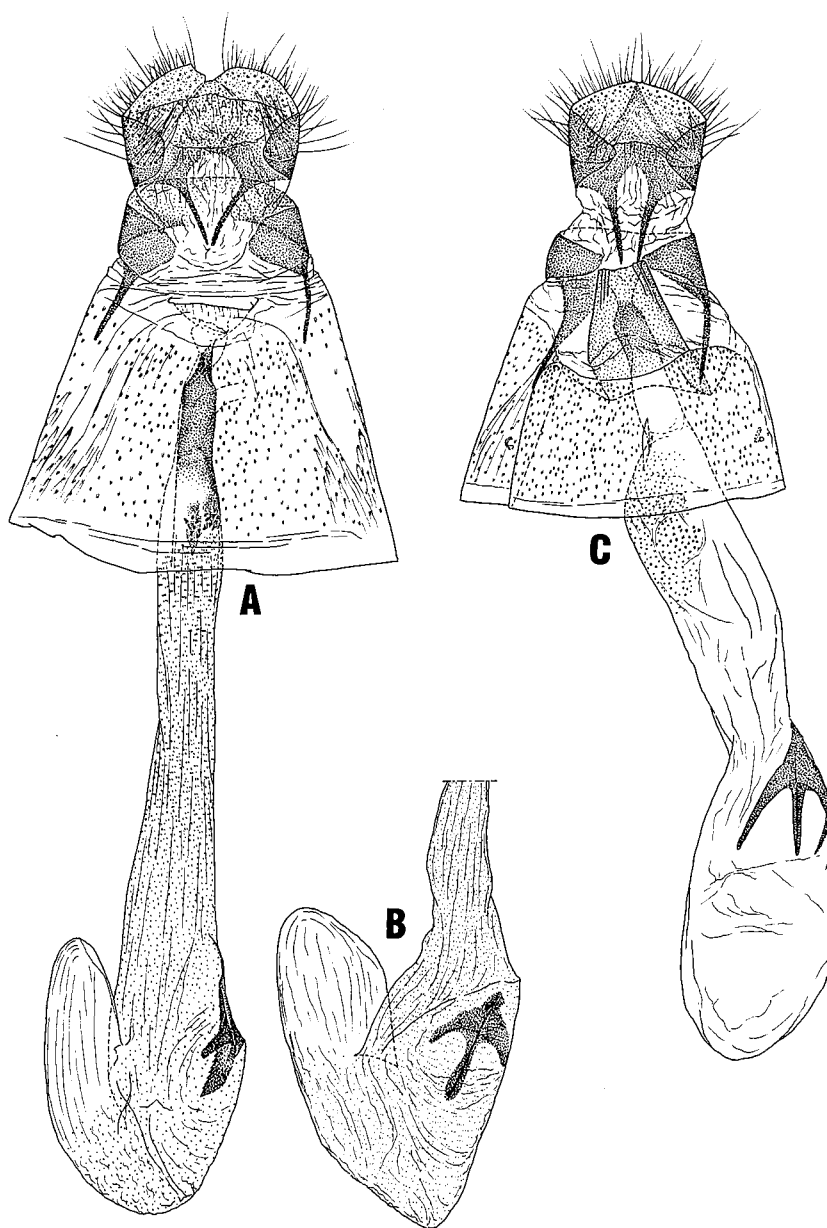


Fig. 5. A & B: *Eumetriochoa kalopanacis* sp. nov. A: Female genitalia in ventral view [paratype, Gen. sl. no. Grc-5039] — B: Apical part of bursa copulatrix [paratype, Gen. sl. no. Grc-813]. C: *Eumetriochoa hiranoi* sp. nov., female genitalia in ventral view [paratype, Gen. so. no. Grc-5453].

with black irroration on their inner sides, and apical three fasciae not reaching termen, and wedge-shaped or triangular; cilia always grayish white, with a round, blackish subapical

fringe line around apex of wing and two similar lines along termen. Hind wing grayish, with cilia grayish white.

Aestival form: Very different from autumnal form in snow white ground colour which covers almost whole the surface of moths. Head, labial palpus and antenna snow white; second segment of labial palpus apically and terminal segment medianly spotted with fuscous below; antenna annulated with fuscous, with scape and its pecten snow-white. Thorax snow white wholly. Legs snow white, with fuscous maculations as in autumnal form.

Fore wing snow white in ground colour, with five narrow ochreous brownish fasciae and five same coloured costal spots, one of which is placed in interspace between the base and the first fascia and the others between fasciae; these fasciae arranged nearly equidistantly on wing from subbase to subapex, the first two being angulated outwardly and the others oblique outwardly from costa; in one specimen first fascia not reaching dorsal margin, and costal spots much reduced and almost disappearing; cilia white, with a black fringe line around apex of wing and two similar lines along termen as in autumnal form. Hind wing and its cilia grayish white.

Male genitalia (Fig. 4): Tegumen spatulate in ventral view, with a pair of setose areas near base; tuba analis cylindrical, setose apically, with a slender subscaphium. Valva elongate, slightly constricted at middle; costa semicircularly convex in apical half; apex produced into a beak-shape, with a thorn-like apical seta; ventral margin nearly straight; a moderately large, pyramid-shaped projection projected from centre of inner face; plumose setae occurring on convex area rather densely and normal setae along ventral margin sparsely. Vinculum moderately long, round laterally, with saccus slender, widened at apex, and 1.3 to 1.5 times as long as vinculum at ventrum; juxta wide-triangular. Aedeagus about 1.5 times as long as valva, tubular, slightly tapering, curved; vesica with a small, irregularly sclerous plate at apex of aedeagus and a minute hook-shaped cornutus behind it. Eighth abdominal segment very weakly sclerotized, with sternite glabrous and tergite very sparsely squamose. (Three slides examined.)

Female genitalia (Fig. 5(A, B)): Papilla analis setose as usual, sparsely spinulose along caudal margin alone; apophysis posterioris slender, dilated basally, a little longer than apophysis anterioris. Ostium bursae membranous, without genital plate; antrum occupying basal part of ductus bursae, elongate-tubular, narrower at base, with irregular, thorn-like spines along its apical margin; ductus bursae gradually dilated towards corpus bursae without distinct boundary between them, densely scobinated throughout; corpus bursae always reversely bent near apex; a single signum moderately long, blade-like, with a triangular basal plate, of which the lateral part sometimes extends into a wing-shape. Seventh abdominal segment normal in structure, but lateral parts of the sternite squamose more sparsely than on ventral area. (Four slides examined.)

Larva. Not examined.

Specimens examined. Adult: 6 ♂ & 4 ♀. Holotype: ♂ (autumnal form), Nopporo, Hokkaido, ex. 14/x/1977 (T. Kumata), ex *Kalopanax pictus* (1745), Gen. sl. no. Grc-5037, deposited in Hokkaido University. Paratypes: Autumnal form: HOKKAIDO — 1 ♂ & 1 ♀, same data as holotype, em. 17–24/x/1977. HONSHU — 1 ♂ & 1 ♀, Osirakawa, Azumi-mura, Nagano-ken, em. 13–15/ix/1992 (N. Hirano), ex *K. pictus* (1077); 3 ♂, same locality, em. 25/ix–2/x/1992 (N. Hirano), ex *K. pictus* (1124). Aestival form: HOKKAIDO — 1 ♀, Daisetzuan (alt. ca 2,000 m), 10/vii/1962 (T. Kumata). HONSHU — 1 ♀, Osirakawa, Azumi-mura, Nagano-ken, em. 10/viii/1992 (N. Hirano), ex *K. pictus* (1051).

Distribution. Japan (Hokkaido; Honshu).

Food plant. *Kalopanax pictus* (Thunb.) Nakai (Araliaceae).

Biology. According to the collecting and breeding data, there are two generations in a

year. Adult seems to fly in summer from July to mid August and again in autumn from end September to October. Moreover, this species may be overwintered in adult stage, because its food plant is deciduous and is no longer used by the larvae of a further generation in winter.

E. kalopanacis is an upper leaf-miner throughout its larval period. The mine (Fig. 25(A, B)) is narrowly linear, but gradually widened towards the terminal end according to the growth of larvae. It is irregularly curved, sometimes serpentine, but not winding unlikely that of the preceding two species. A dark brownish line of frass is always seen in the centre of the mine. A pupal chamber is found at the end of the mine, ellipsoidal in form, with a swollen lower side and a wrinkled upper side as in the preceding two species.

Remarks. As the colour-pattern of the fore wing is rather variable, this new species is not easily distinguished from the preceding two by this character. It is, however, at once separated from them by the genitalia of both sexes as follows: — Male valva with a semicircularly convex costal margin near apex and with a pyramid-shaped projection in centre; male aedeagus with a small plate-like cornutus at apex and a minute hook-shaped one behind it; female antrum longer, with terminal margin irregularly spinose; female corpus bursae reversely bent near apex.

Eumetriochoera hiranoi sp. nov.

[Figs. 5(C), 6, 12(G,H), 14(E), 19, 25(C, D)]

So far as I have examined, the present material emerged in spring and summer in Honsyu and in spring and autumn in Ryukyu Islands, but there is no seasonal form in colour-pattern.

Adult. ♂ & ♀.

Measurement. Expanse of wings, 4.6 – 6.1 mm (5.0 mm in holotype); length of fore wing, 2.0 – 2.8 mm (2.3 mm in holotype).

Description. Face, vertex and labial palpus snow white, with second segment of palpus apically and the terminal segment medianly ringed with fuscous. Antenna as long as or a little shorter than fore wing, annulated with fuscous; scape and its hairy pecten snow white. Thorax snow white. Legs white; fore femur fuscous on apical half, tibia fuscous except on outer ridge, and tarsus with four blackish rings; mid tibia with two fuscous spots in middle and at apex, and tarsus with four blackish rings; hind tibia smooth-scaled and faintly ringed with fuscous apically, and tarsus with four blackish rings. Abdomen pale ochre gray dorsally and whitish ventrally, without transverse dark bands.

Fore wing snow white in ground colour, with an ochre brownish costal spot near base and five same coloured oblique fasciae arranged from subbase to subapex; first fascia at subbase usually not reaching dorsal margin, and sometimes reduced into a costal spot; third fascia also detached from dorsal margin or interrupted by ground colour at wing fold in most specimens; fourth fascia enclosing a spot of blackish irroration in its apex just beyond tornus; an ochre brownish line running in interspace between first and second fasciae and a further one between third and fourth fasciae in some specimens including holotype; apical extremity of wing faintly tinged with ochre; cilia whitish gray, with a vertical fringe line of black irroration at apex of wing and two similar, but curved, lines along termen. Hind wing whitish gray, becoming paler towards base, with cilia grayish white.

Male genitalia (Fig. 6): Tegumen oblong, round apically in ventral view, with a pair of setose areas near base; tuba analis tubular or subconical, truncate, rather sparsely setose on

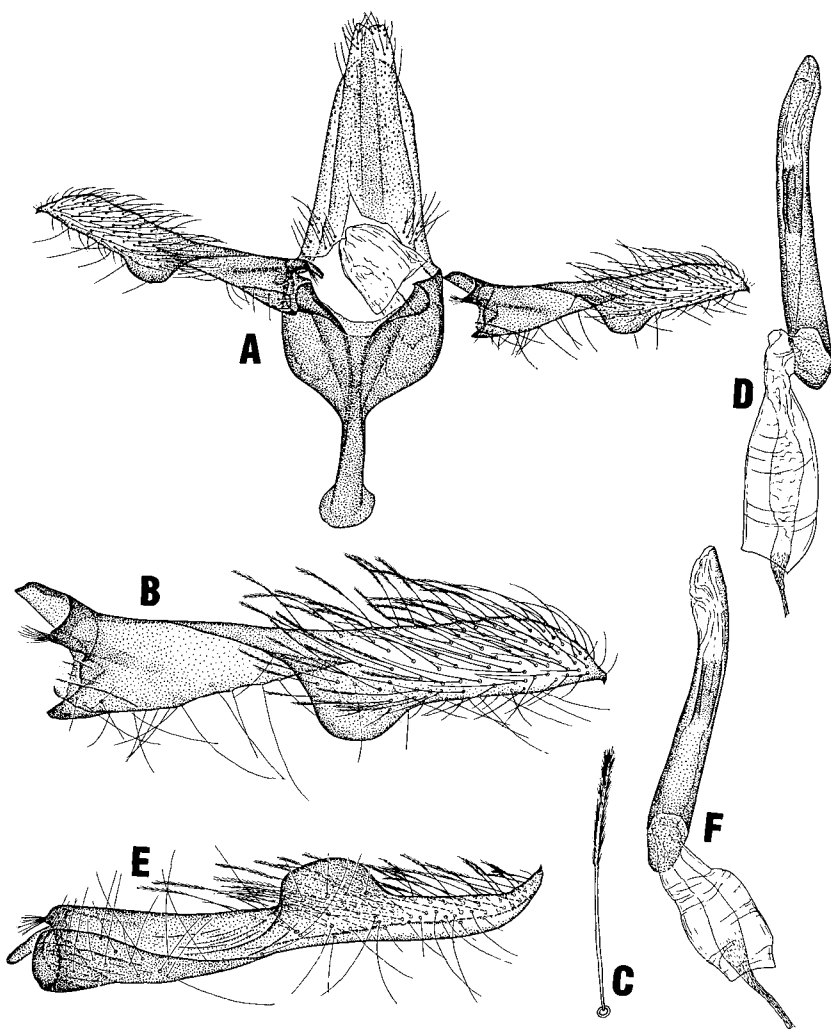


Fig. 6. *Eumetriochroa hiranoi* sp. nov. A: Male genitalia in ventral view, aedeagus omitted [holotype, Gen. sl. no. Grc-5452] — B: Right valva enlarged [ditto] — C: A plumose seta on valva enlarged [ditto] — D: Aedeagus [ditto] — E: Right valva [paratype, Gen. sl. no. Grc-5338] — F: Aedeagus [ditto].

apical area, with subscaphium indistinct. Valva a little longer than tegumen, narrow, acutely pointed apically, with a short, thorn-like seta at apex and a large, round or wide-trapeziform lobe lying obliquely from middle of dorsal margin to apical third of costa; plumose setae densely occurring on inner face of apical half and normal setae sparsely along dorsal margin throughout. Vinculum moderately elongated, round laterally; saccus nearly as long as vinculum at ventrum, slender, knobbed apically. Aedeagus about 1.3 times as long as valva,

tubular, obliquely truncated apically; vesica with a weakly sclerous, tubular part near middle of aedeagus, the sclerous part being about one-fifth as long as aedeagus. Eighth abdominal segment weakly sclerotized, with sternite glabrous and tergite very sparsely squamose. (Three slides examined.)

Female genitalia (Fig. 5(C)): Papilla analis setose as usual, but not spinulose at all; apophysis posterioris slender, widened at base, a little longer than apophysis anterioris. Ostium bursae well produced caudad, conical with a truncated apex, nearly as long as apophysis posterioris; antrum shortly cylindrical, narrowed caudad; ductus bursae moderately long, membranous, on antemedian swollen part with a large patch lined with triangular spinules; corpus bursae ellipsoidal; a single signum narrowly blade-like, with a laterally elongated, triangular basal plate, the lateral elongations being very sharp and produced cephalad. Seventh abdominal sternite with caudal margin emarginate. (Four slides examined.)

Larva. Body chaetotaxy of last (spinning) instar: Chaetotaxy of all body segments very similar to that of *E. miyatai*, especially in absence of seta SD1 on all abdominal segments, but slightly different from latter as follows: — Seta SD2 present on metathorax and about as long as seta SD1 in both mesothorax and metathorax; seta D1 slightly shorter than seta D2 in all abdominal segments. All thoracic legs reduced into small round protuberances; ventral prolegs on third to sixth abdominal segments represented by small glabrous plates without crochets; and anal proleg indistinct. Prothoracic and anal dorsal shields not developed.

Specimens examined. Adult: 5♂ & 11♀. Holotype: ♂, Yutun – Inda, Iriomote I., Ryukyu Is., em. 30/x/1989 (T. Kumata), ex *Styrax japonicus* (3574), Gen. sl. no. Grc-5452, deposited in Hokkaido University. Paratypes: HONSYU — 1♀, Karasugawa, Nagano-ken, 12/vi/1982 (N. Hirano); 1♂ & 3♀, same locality, em. 19/vii–1/viii/1982 (N. Hirano), ex *S. japonicus*; 1♀, Ikezawa, Ikusaka-mura, Nagano-ken, em. 19/viii/1985 (N. Hirano), ex *S. japonicus* (307); 1♂ & 2♀, Komuro, Azusagawa-mura, Nagano-ken, em. 5–6/v/1985 (N. Hirano), ex *S. japonicus*. RYUKYU Is. — 1♂ & 1♀, Kunigami, Kunigami-son, Okinawa I., em. 23/iii/1989 (T. Kumata), ex *S. japonicus* (3455); 1♂ & 2♀, same data as holotype, em. 30/x–3/xi/1989.

Larva: 2 exs. of last (? second spinning) instar and 2 exs. of last sap-feeding instar, mounted on slides, Nisinasuno, Totigi-ken, Honsyu, 30/ix/1975 (T. Kumata), ex *S. japonicus* (1628).

Distribution. Japan (Honsyu; Ryukyu Islands).

Food plant. *Styrax japonicus* Sieb. et Zucc. (Styracaceae).

Biology. Data of the specimens examined suggest that there are two generations in a year in Honsyu and more than two in the Ryukyu Islands. The data also indicate that the species had overwintered either in the mature larva or in the pupa within mines on defoliated leaves of the food plant which is a deciduous tree.

The mine (Fig. 25(C, D)) is found on the upper surface of leaf, long linear, irregularly curved, and somewhat serpentine as in the preceding species. The mining part is discoloured into white, semitransparent, without any dark line of frass. A pupal chamber is placed at the end of mines, ellipsoidal, with a strongly swollen lower side and a wrinkled upper side as in the other species of the genus.

Remarks. This species is superficially very similar to the aestival form of *E. kalopanacis*, but is distinguished from the latter by the genital structures as follows: — In male, valva with a large semicircular or wide-trapeziform lobe in supramedian part and without a pyramid-form projection in antemedian part of the inner surface; and vesica with a single weakly sclerotized, tube-like cornutus in median part of aedeagus. In female, ostium bursae well produced caudad and subconical in form; antrum shorter, without a spinose cephalic

margin; and lateral parts of basal plate of signum more narrowly prolonged cephalad and about as long blade-like signum itself.

This new species is named after Mr. Nagao Hirano of Matumoto, Nagano-ken, for his constantly offering me many valuable material collected at Central Honsyu.

GENUS *METRIOCHROA* BUSCK

Metriochroa Busck, 1900, Proc.U.S. nat. Mus. 23: 244; Vári, 1961, Transvaal Mus., Mem. 12: 196.

Type-species: *Metriochroa psychotriella* Busck, 1900.

Oecophyllembius Silvestri, 1908, Boll. Lab. Zool. Portici 2: 196.

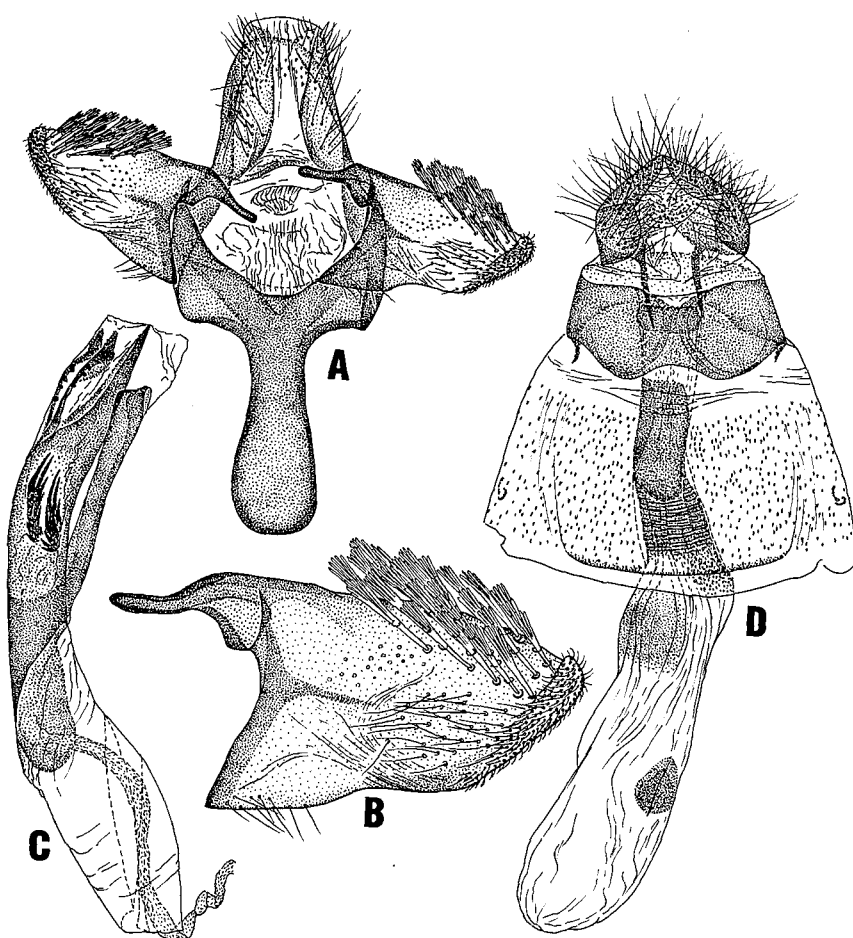


Fig. 7. *Metriochroa latifoliella* (Milliere). A: Male genitalia in ventral view, aedeagus omitted [Gen. sl. no. Grc-5987, Andalusia, Spain] — B: Right valva enlarged [ditto] — C: Aedeagus [ditto] — D: Female genitalia in ventral view [Gen. sl. no. Grc-5988, Bologna, Italy].

Type-species: *Oecophyllembius neglectus* Silvestri, 1908 = *Gracilaria* (sic) *latifoliella* Milliere, 1887.

This genus is well defined by Vári (1961) in adult stage. As larvae of one Japanese species are available for the present study, the following characters of the larva are added to the generic definition.

Additional description.

Larva. So far as the larvae of the last spinning instar of *M. syringae* are concerned, the body chaetotaxy is very similar to that of *Eumetriochoa* and *Cryphiomystis*. But the following characters seem to be specific to *Metriochoa*. Setae of SV-group completely absent on all thoracic segments; SD-group represented by SD1 alone on all thoracic segments; L-group unisetose (L1) on all thoracic segments and bisetose (L1 and L2) on second to eighth abdominal segments; only two pairs of tactile setae (probably D1 and D2) present on ninth abdominal segment.

Remarks. This genus is at once distinguished from *Eumetriochoa* by the absence of vein R_1 in the fore wing and by the presence of the maxillary palpus, from *Cryphiomystis* by the presence of the vein CuA of the fore wing and by the presence of partite scales on the valva, and from *Guttigera* by the presence of vein R_5 in the fore wing though it is weakened.

Up to now nine species are known to be referable to this genus (see Appendix I), but no species is known from Asia. In the following lines two species will be added to the genus from Japan. So far as their food plants are known, three Palearctic species including two new species from Japan are leaf-miners on Oleaceae, one Nearctic species on Rubiaceae, and the remaining African species on Asclepiadaceae, Balsaminaceae or Apocynaceae. The mine is found on the upper side or very rarely on the lower side of leaves of food plants, very long, narrowly linear, irregularly curved into a serpentine type. Pupation takes place inside the mine, and pupal chambers are very similar to those of *Eumetriochoa* and *Phyllocnistis*.

KEY TO THE JAPANESE SPECIES OF THE GENUS METRIOCHROA

1. Fore wing ochre grayish with dense fuscous irroration, with four costal and four or five dorsal indistinct ochreous spots; male tegumen with a pair of large clavate projections bearing four to six curved bristly apical setae; valva blunt apically, with partite scales occurring on costal margin in apical half; female signum triangular, with a blade-like central invagination; upper leaf-miner on *Fraxinus* and *Ligustrum*. *M. fraxinella* sp. nov.
- Fore wing dark grayish with a metallic lustre in ground colour, sparsely irrorated with fuscous in apical half, without ochreous marks; male tegumen sparsely setose laterally as usual; valva bifurcated apically, with partite scales scattered in disc near apex; female signum very narrowly bar-shaped, long, without any invagination; lower leaf-miners on *Syringa*. *M. syringae* sp. nov.

Metriochoa fraxinella sp. nov.

[Figs. 8, 13(A, B), 15(A), 26(A, B)]

Adult. ♂ & ♀.

Measurement. Expanse of wings, 5.2 – 8.2 mm (6.1 mm in holotype); length of fore wing, 2.4 – 3.9 mm (2.9 mm in holotype).

Description. Head dull grayish, paler in face; in some specimens vertex irrorated with fuscous sparsely. Palpi pale ochreous; apical segment of labial palpus with a fuscous median

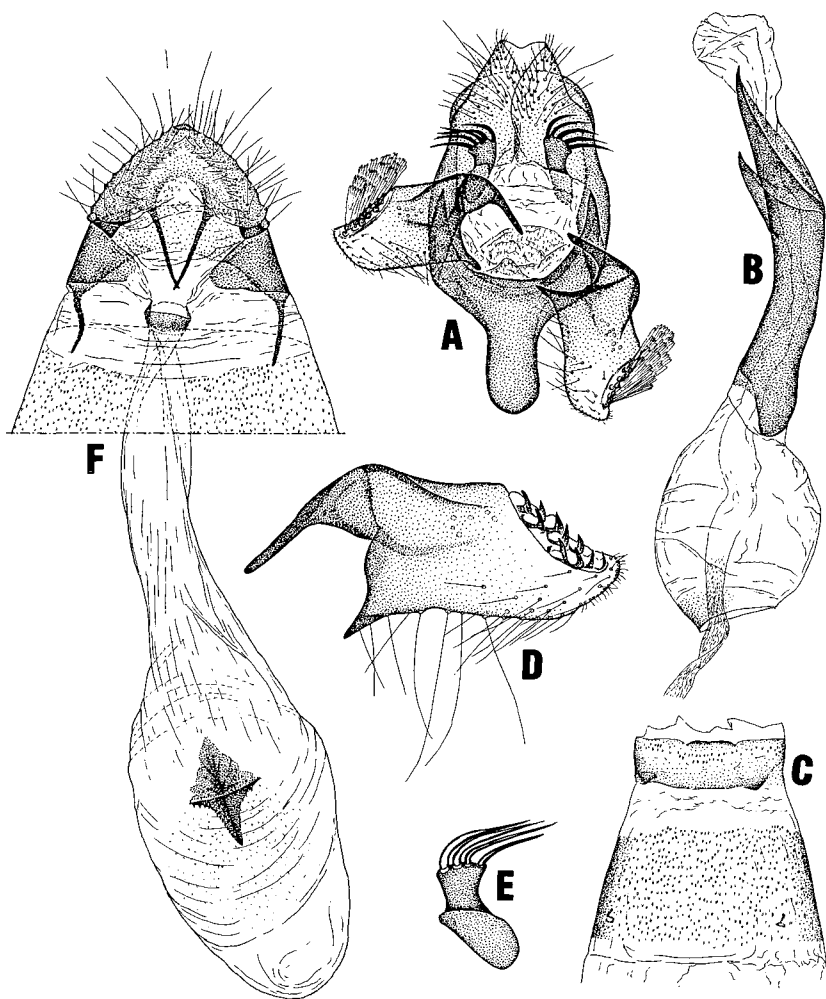


Fig. 8. *Metriochroa fraxinella* sp. nov. A: Male genitalia in ventral view, aedeagus omitted [holotype, Grc-5459] — B: Aedeagus [ditto] — C: Seventh and eighth abdominal segments of male in ventral view [ditto] — D: Right valva [paratype, Gen. sl. no. Grc-1794] — E: A projection of tegumen, enlarged [ditto] — F: Female genitalia in ventral view [paratype, Gen. sl. no. Grc-5125].

blotch below. Antenna a little shorter than fore wing, fuscous, faintly annulated with ochre; scape grayish dorsally and ochreous ventrally, with hairy pecten ochreous. Thorax dull grayish, paler ventrally. Legs pale ochreous gray; fore coxa fuscous basally, femur and tibia dark fuscous laterally, and tarsus with five blackish rings; mid tibia with three oblique dark fuscous stripes and tarsus with five rather broad blackish rings; hind coxa dark fuscous on basal half, femur widely dark fuscous on median part, tibia gradually darkened apically, and tarsus with five broad blackish rings, basal two of which are fused to one another into a broad ring to occupy almost whole first tarsal segment in some specimens from Ogasawara Is. Abdomen grayish dorsally, pale ochreous ventrally, with a series of dark gray spots

laterally.

Fore wing ochre grayish with dense fuscous irroration in ground colour, with four costal and four or five dorsal, indistinct, ochreous spots; in specimens from Ogasawara Is. the ground colour much darker, almost dark fuscous, with ochreous marks more distinct, wedge-shaped, and apicalmost pair of costal and dorsal ones fused to form a subapical transverse fascia; cilia ochre whitish, at apex with two vertical fringe lines of black irroration, and along termen with two or three similar fringe lines running in parallel with termen. Hind wing grayish, with cilia pale grayish.

Male genitalia (Fig. 8(A-E)): Tegumen moderate in length, widely round apically in ventral view, with a pair of large, clavate projections on ventral face, the projection having four to six outwardly curved, bristly setae; tuba analis bilobed apically, with sparse setae on each apical lobe. Vinculum Y-shaped, round laterally, with saccus thickly clavate. Valva about two times as long as wide, but shorter than tegumen, with an obtuse apex obliquely truncated in costal side and round in ventral side; a group of partite scales occurring along truncated costal side and very fine setae along round ventral side near apex of valva, further long and moderate setae sparsely on ventral area throughout. Aedeagus about three times as long as valva, thickly tubular, very obliquely truncated apically; vesica without any cornutus. Eighth abdominal segment short, very sparsely squamose on its caudal area alone. (Six slides examined.)

Female genitalia (Fig. 8(F)): Papilla analis with microscopic spinules along caudal margin besides usual slender setae; apophysis posterioris slender, a little longer than apophysis anterioris. Ostium bursae without sclerous genital plate; antrum very shortly sclerotized, ring-shaped; ductus bursae tubular, moderately long, wholly membranous, not spinulose; corpus bursae pyriform, with a triangular signum, which is sparsely spinulose and has a blade-like central invagination; microscopic spinules scattered on area cephalic to signum. (Seven slides examined.)

Larva. Not examined.

Specimens examined. Adult: 7 ♂ & 17 ♀. Holotype: ♂, Inekoki, Azumi-mura, Nagano-ken, Honsyu, em. 7/x/1989 (N. Hirano), ex *Fraxinus sieboldiana* (691), Gen. sl. no. Grc-5459, deposited in Hokkaido University. Paratypes: HONSYU — 1 ♂ & 1 ♀, same data as holotype, em. 18/ix-9/x/1989; 1 ♂ & 5 ♀, Rokusyo-san, Toyota, Aiti-ken, em. 13-15/iv/1979 (Y. Arita), ex *Ligustrum japonicum*; 3 ♀, Okino-sima, Simane-ken, em. 18/x-5/xi/1987 (T. & M. Kumata), ex *Fraxinus* sp. (2953). KYUSYU — 1 ♂ & 2 ♀, Hikosan, Hukuoka-ken, em. 20/vi/1957 (T. Kumata), ex *Fraxinus sieboldiana* (193); 1 ♂ & 2 ♀, same locality, em. 1-3/vii/1965 (T. Kumata), ex *Fraxinus* sp. (667). OGASAWARA Is. — 2 ♂ & 3 ♀, Titi-zima, em. 4-14/xii/1984 (T. Kumata), ex *Ligustrum micranthum* (2525).

Distribution. Japan (Honsyu; Kyusyu; Ogasawara Islands).

Food plants: *Fraxinus* spp. including *F. sieboldiana* Blume, *Ligustrum japonicum* Thunb. and *L. micranthum* Zucc. (Oleaceae).

Biology. This new species is a leaf-miner during the larval period and is pupated within the mine as in other species of the genus and members of the preceding *Eumetriochoa*. The mine (Fig. 26(A, B)) is placed under the upper cuticle of leaves, narrowly linear, very long, irregularly curved, and sometimes occupies whole the surface. It is usually whitish in appearance, with a brownish central line of frass. A pupal chamber is located at the end of the mine, ellipsoidal, with a strongly swollen lower side and a wrinkled upper side.

The number of generations has not been defined in this study because of insufficient

data of breeding and collecting. It is, however, to say that there are at least two generations in a year in temperate Japan (Honsyu and Kyusyu), because adults emerged in summer (June to July) and in autumn (late September to early October) in case that the larvae attacked deciduous trees such as *Fraxinus* spp. On the other hand, some adult specimens were reared in early spring (April) from larvae feeding on an evergreen tree, *Ligustrum japonicum*, in Central Honsyu. These data suggest that in this species the overwintering stage is different between the populations feeding on evergreen trees and on deciduous trees.

Remarks. This new species superficially resembles *M. latifoliella* (Milliere) (Fig. 7) known to mine in leaves of Oleaceae in South Europe, but is at once distinguished from the latter by the presence of ochreous spots on the fore wing and also by the presence of a pair of clavate and apically setose projections on the male tegumen.

Metriochroa syringae sp. nov.

[Figs. 9, 13(C, D), 15(B), 20(C, D), 23(A), 26(C, D)]

Adult. ♂ & ♀.

Measurement. Expanse of wings, 5.6 – 6.5 mm (5.7 mm in holotype); length of fore wing, 2.6 – 3.1 mm (2.7 mm in holotype).

Description. Head dark grayish with a metallic luster; face a little paler. Palpi ochreous gray, with apical segment of labial palpus fuscous below at subapex. Antenna about as long as fore wing, dark grayish, annulated with ochre white; scape and its pecten whitish gray. Thorax brilliantly dark grayish dorsally, ochre brownish ventrally. Legs ochre whitish; fore coxa fuscous below, femur and tibia blackish laterally, and tarsus widely ringed with black except at base of each segment; mid tibia with three fuscous oblique streaks and tarsus with four wide black rings: hind femur medianly and tibia apically blackish on lateral side, and tarsus with three blackish rings. Abdomen fuscous dorsally, ochre whitish ventrally, with four narrow fuscous bands on ventrum.

Fore wing with vein M_3 absent; ground colour dark grayish with a metallic lustre, more or less irrorated with fuscous in apical half; cilia pale ochre grayish, with two vertical fringe lines of black irroration at apex of wing and three similar fringe lines along termen, the lines along termen being convergent towards apex of wing. Hind wing gray, with cilia pale gray.

Male genitalia (Fig. 9(A–C)): Tegumen moderate in length, round apically, with sparse lateral rows of setae; tuba analis subcylindrical, bilobed apically, with sparse setae on apical areas. Vinculum more or less lengthened, angulated at laterocephalic corners, with a clavate saccus about as long as vinculum at ventrum. Valva a little longer than tegumen, more or less wing-shaped; costal margin upcurved; ventral margin nearly straight; apex divided into two finger-shaped processes, the inner process being bent upwardly and finely setose on its inner surface, the outer process more or less drooping and very sparsely setose on its ventral margin; about 20 partite scales scattered in disc from middle to apical fifth; a group of fine setae occurring on base of ventral margin. Aedeagus about 2.3 times as long as valva, thickly tubular, very obliquely truncated, with a very sharply pointed apex; an apically round plate fixed on dorsal side of aedeagus; vesica without cornutus. Eighth abdominal segment short, very sparsely squamose on caudal area alone. (Three slides examined.)

Female genitalia (Fig. 9(D)): Papilla analis moderate in width, with microscopic spinules scattered along caudal margin, and with long setae as usual; apophysis posterioris

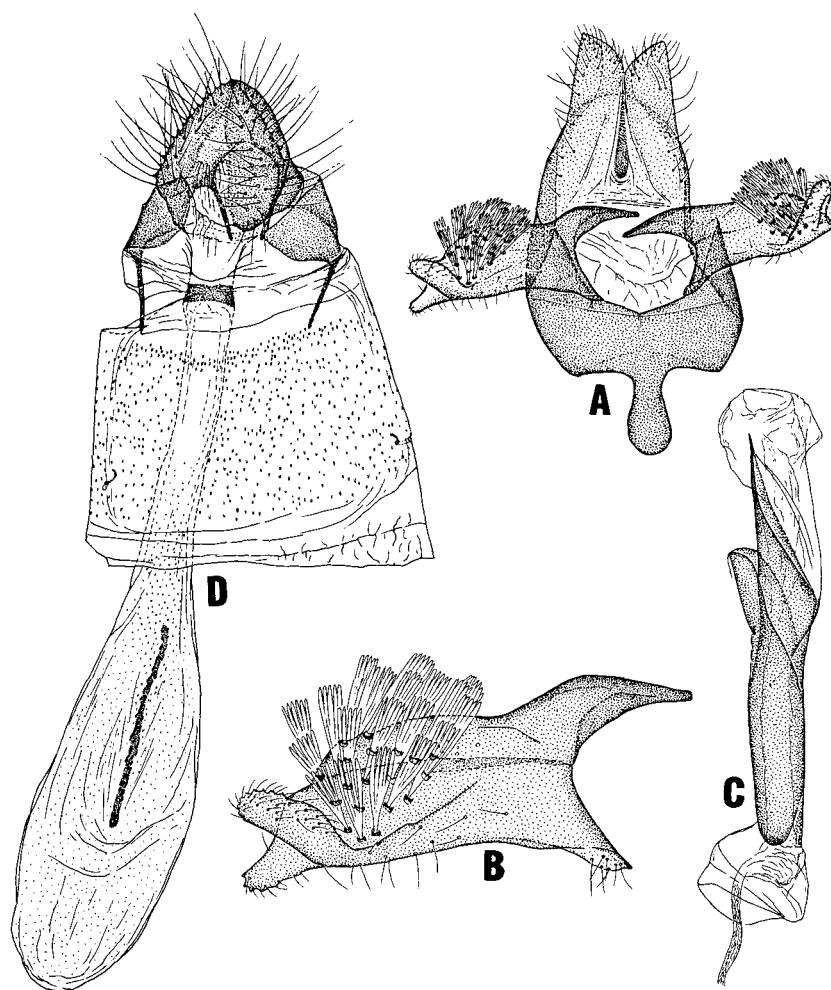


Fig. 9. *Metriochoera syringae* sp. nov. A: Male genitalia in ventral view, aedeagus omitted [holotype, Gen. sl. no. Grc-5389] — B: Left valva enlarged [ditto] — C: Aedeagus [ditto] — D: Female genitalia in ventral view [paratype, Gen. sl. no. Grc-6357].

slender, about as long as apophysis anterioris. Ostium bursae without sclerous genital plate; antrum very short, ring-shaped; ductus bursae tubular, about as long as seventh abdominal segment, membranous; corpus bursae elongately ellipsoidal, with a long, slender signum, which consists of a few rows of many spinules and is about $\frac{2}{3}$ as long as the corpus bursae; rather dense microscopic spinules present on corpus bursae throughout. (Two slides examined.)

Larva. The number of larval instars is not determined, but, after several instars of the sapfeeding morph, two instars of the nonfeeding, spinning morph follow them.

Body chaetotaxy of last (second spinning) instar (Fig. 23(A)): All thoracic legs and abdominal prolegs reduced into paired ventral protuberances, without claw and crochets, respectively; the abdominal protuberances occurring on third to sixth segments. A pair of

thoracic spiracles opened at anterolateral areas of mesothorax as in larvae of *Eumetriochroa*. Setae of body very shortened, but L1 and SD1 usually prominent and the longest among setae on all thoracic and abdominal segments. Prothorax with dorsal shield absent, and tactile setae SD2, L2, SV1 and SV2 also absent; proprioceptor MV2 placed anteriorly of ventral protuberance. Mesothorax and metathorax with setae SD2, L2, L3, and SV1 absent, but supposed proprioceptors MV2 and MV3 present around ventral protuberances. First abdominal segment reduced in number of setae, with L1, SV1, SV2 and SV3 absent. Second to sixth abdominal segments with similar chaetotaxy to each other; setae L3, SV3 and V1 absent, D1 usually longer than D2, and SV1 and SV2 placed anteriorly of ventral protuberances except on second segment. Seventh and eighth abdominal segments slightly different from the preceding ones in lacking all setae of SV-group. Ninth abdominal segment with two setae on each sides (probably D1 and D2). Proprioceptor MV3 absent on all abdominal segments and MD1 also absent on the ninth.

Specimen examined. Adult: 5 ♂ & 4 ♀. Holotype: ♂, Sapporo, Hokkaido, em. 29/viii/1989 (T. Kumata), ex *Syringa reticulata* (3503), Gen. sl. no. Grc-5389, deposited in Hokkaido University. Paratypes: 4 ♂ & 4 ♀, same locality with holotype, em. 23–29/viii/1995 (T. Kumata), ex *S. reticulata* (5300).

Larva. 1 ex. of first spinning instar, 1 ex. of second spinning instar and 3 exs. of last sap-feeding instar, Sapporo, Hokkaido, 23/viii/1995 (T. Kumata), ex *S. reticulata* (5300).

Distribution. Japan (Hokkaido).

Food plant. *Syringa reticulata* (Blume) Hara (Oleaceae).

Biology. The number of generations and the overwintering stage of this new species are unknown, but all the specimens examined were reared in August from mines occurring on the lower side of leaf of the food plant. The mine (Fig. 26(C, D)) is narrowly linear in the early stage, then gradually widened, very long, irregularly curved, and sometimes fused into a large blotch. The last sap-feeding larva makes an inter parenchymal mine, so that the mine is seen from the upper side of the leaf as a trace of pale greenish mottles in this stage. A pupal chamber is found within the mine, but not always at the end of the mine, ellipsoidal, with very slightly swollen upper and lower sides.

Remarks. This new species is rather difficult to separate from *M. latifoliella* (Milliere) and *M. fraxinella* (sp. nov.) by the colour pattern alone. But it is at once distinguished from the latter two by the apically divided male valva with partite scales scattered in the inner surface, by the laterally angulated male vinculum with a rather short saccus, and by the long narrow signum of the female corpus bursae. It is also distinct in making a mine on the lower side of leaves.

GENUS CRYPHIOMYSTIS MEYRICK

Cryphiomystis Meyrick, 1922, Exotic Microlep. 2: 563; Vári, 1961, Transvaal Museum, Mem. 12: 200.

Type-species: *Cryphiomystis pentarcha* Meyrick, 1922.

This genus is well defined by Vári (1961). Based on the two Japanese species described below, the following characters of the genitalia and larva are added to the generic definition.

Additional description.

Male genitalia: Tegumen short, membranous, without lateral apodemes connected with vinculum, so that there is no ring formed by the connection between tegumen and vinculum.

Tuba analis widely tubular, thickly setose on almost whole surface, with a median elongate subscaphium. Vinculum tightly united with valvae, with well-developed saccus. Valvae ventrally united with each other at least in their basal half, covered with sparse slender setae alone. Dorsal part of diaphragma (fultura superior) well sclerotized, oblong, triangular apically. Eighth abdominal segment shortly sclerotized, glabrous; seventh segment normal in structures as in the preceding segments.

Female genitalia: Papillae anales dorsally united with each other at apical extremity alone as in most members of the Gracillariidae and not as in *Eumetriochroa* and *Metriochroa*. Ostium bursae variable in sclerotization, with or without genital plate. Antrum usually shortly sclerotized, or rarely membranous; ductus bursae short or absent; corpus bursae large, with or without signum (or signa).

Larval chaetotaxy. So far as the last spinning instar larvae of *C. sunosei* are concerned, the larval chaetotaxy is essentially similar to that of *Eumetriochroa* and *Metriochroa* in having supposed proprioceptors MV2 and MV3 on all thoracic segments, two setae of SV-group on second to sixth abdominal segments, and three tactile setae (D1, D2 and SD1) on ninth segment. Moreover, the thoracic spiracles opened on the mesothorax are a common character with the genera *Eumetriochroa* and *Metriochroa*.

On the other hand, the following characters may be peculiar to the genus *Cryphiomystis*: — All proprioceptors absent in all abdominal segments; seta V1 and proprioceptor MV3 on mesothorax and V1 on first abdominal segment very thick, with a large basal socket; L-group on second to seventh abdominal segments bisetose (L1 and L2); tenth abdominal segment with two pairs of setae (probably D1 and SD1) on dorsal side.

Remarks. The genus *Cryphiomystis* is allied to *Metriochroa*, but is at once distinguished from the latter (and also from *Eumetriochroa* and *Guttigera*) by the absence of the veins M₃, CuA₁ and CuA₂ in the fore wing, and by the genital characters stated in Additional description.

Up to now three species referable to the present genus are known from Africa and Sri Lanka (see Appendix I), and one species, *Heliozela praeustella* Deventer described from Indonesia, may be transferred to this genus. In this paper two new species are added to the genus from Japan. Four of them are leaf-miners on Rubiaceae, and one is on Actinidiaceae. Further, more than ten species emerged from larvae feeding mainly on Rubiaceae in Southeast Asia. The mine occurs usually on the upper side of leaf of food plants, and is narrowly linear, sometimes serpentine as in most members of the preceding genera and *Phyllocnistis*. The pupal chamber is also similar to that of these genera, being placed at the end of the mine, ellipsoidal, with a swollen lower side and a wrinkled upper side.

KEY TO THE JAPANESE SPECIES OF THE GENUS CRYPHIOMYSTIS

1. Hind tarsus with five whitish rings; apical incision between valvae round at depth, reaching about apical third of valvae; valva acutely angulated apically, with apex obliquely upcurved; apex of fultura superior reaching middle of incision between valvae; ostium bursae surrounded with circular genital plate; ductus bursae weakly sclerotized and well striated on its cephalic three-fourths; leaf-miner on *Uncaria*. *C. sunosei* sp. nov.
- Hind tarsus with four fine whitish rings; apical incision between valvae triangular, reaching about apical fifth of valvae; valva obtusely angulated apically; apex of fultura superior reaching apical level of valvae; ostium bursae covered with a crescent-shaped lamella antevaginalis; ductus bursae very short, wholly membranous; leaf-miner on *Saurauia*. *C. yaeyamensis* sp. nov.

Cryphiomystis sunosei sp. nov.
[Figs. 10, 13(E, F), 15(C), 23(B), 27(A, B)]

Adult. ♂ & ♀.

Measurement. Expanse of wings, 4.4 – 6.7 mm (5.4 mm in holotype); length of fore wing, 2.1 – 3.1 mm (2.5 mm in holotype).

Description. Face silvery grayish, slightly paler anteriorly; vertex dark fuscous, with blackish reflection. Palpi ochre-whitish; apical segment of labial palpus fuscous apically. Antenna a little shorter than fore wing, dark fuscous wholly. Thorax, tegulae and legs dark

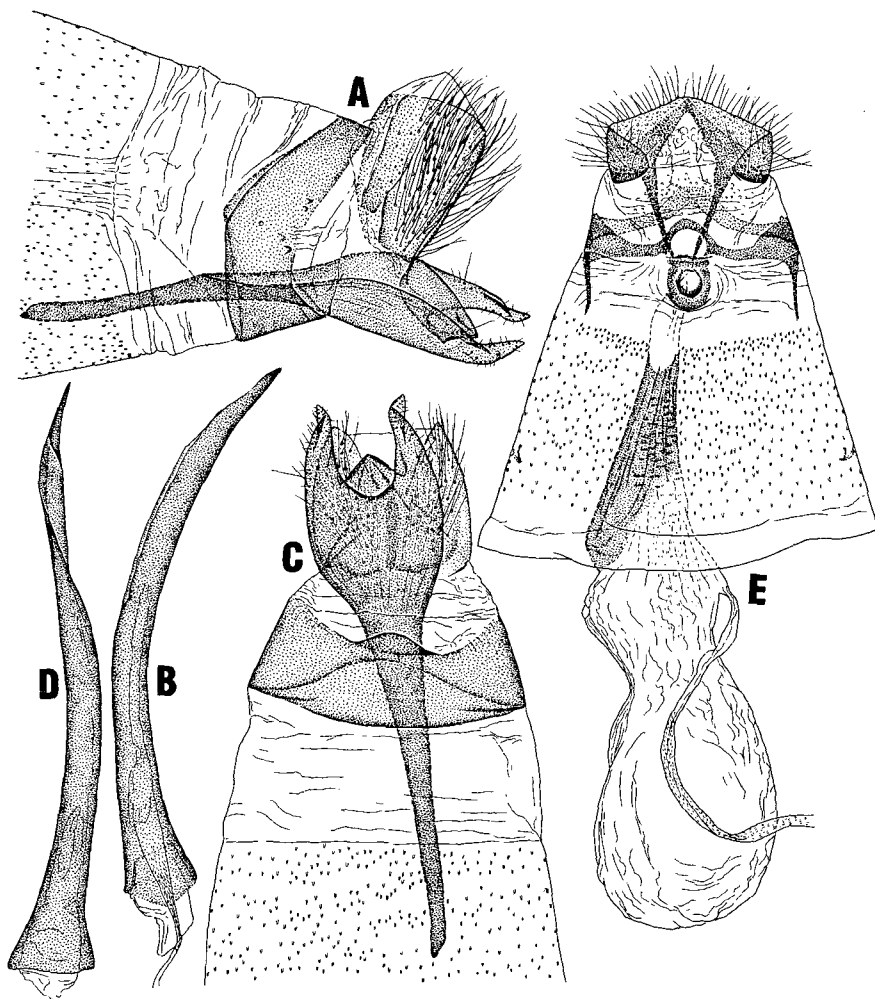


Fig. 10. *Cryphiomystis sunosei* sp. nov. A: Male genitalia in lateral view, aedeagus omitted [paratype, Gen. sl. no. Grc-5561]—B: Aedeagus [ditto] — C: Male genitalia in ventral view, aedeagus omitted [holotype, Gen. sl. no. Grc-5560] — D: Aedeagus [ditto] — E: Female genitalia in ventral view [paratype, Gen. sl. no. Grc-5064].

fuscous; all tarsi with five narrow whitish rings. Abdomen dark fuscous dorsally and silvery grayish ventrally.

Fore wing dark fuscous, with bluish reflection especially strongly at tornus; cilia grayish, with two or three round fringe lines of blackish irroration around apex of wing, the inner side of basalmost fringe line being fuscous. Hind wing fuscous, with cilia grayish.

Male genitalia (Fig. 10(A–D)): Tegumen nearly membranous, sparsely squamose dorsally, without lateral arms connected with vinculum; tuba analis thickly cylindrical, bilobed apically, densely setose on lobes, with a slender subscaphium. Vinculum tightly united with valvae, with a well-developed, cylindrical saccus, which is about half as long as aedeagus and tapers apically. Basally united valvae with a round apical incision between them, the incision reaching about apical third of valvae; each valva round laterally, tapering apically, with apex obliquely upcurved; fine setae scattered on apical area of valva. Fultura superior triangular at apex in dorsoventral view, with its apex at most reaching middle of incision between valvae. Aedeagus needle-shaped, sharpened apically and thickened basally, slightly curved, without any cornutus on vesica. Eighth abdominal segment weakly sclerotized, glabrous, with a small round caudal lobe at ventrum. (Three slides examined.)

Female genitalia (Fig. 10(E)): Papilla analis short, setose as usual, without microscopic spinules on surface; apophysis posterioris slender, long, about 2 times as long as apophysis anterioris. Eighth abdominal segment shortly sclerotized, with sternite partly arched caudally on ventrum; ostium bursae located just anterior to this arch, round, and surrounded with a circular genital plate. Ductus bursae short, dilated towards corpus bursae, weakly sclerotized and well striated in its cephalic three-fourths; corpus bursae ellipsoidal, membranous, without signum. (Four slides examined.)

Larva. Body chaetotaxy of spinning instar (Fig. 23(B)): Similar to that of second spinning instar of *Eumetriochroa miyatai* in essential respects, but differs in the following points: — Proprioceptors invisible in all segments except for MV2 and MV3 on thoracic segments. Seta D1 on prothorax located posterolaterally to XD1; SV-group absent on mesothorax and metathorax; V1 and MV3 on metathorax and V1 on first abdominal segment very thickened, with a large basal socket; V1 on second to seventh abdominal segments absent as in the 8th and 9th; SD1 present on all abdominal segments; tenth segment with two pairs of setae on dorsal side, probably D2 being absent.

Thoracic spiracles are located on the mesothorax near the cephalic margin.

Specimens examined. Adult: 3 ♂ & 5 ♀. Holotype: ♂, Kagosima-si, Kyusyu, em. 6/i/1975 (T. Sunose), ex *Uncaria rhynchophylla* (2396), Gen. sl. no. Grc-5560, deposited in Hokkaido University. Paratypes: 1 ♂ & 1 ♀, same locality as holotype, em. 11/xi/1973 (T. Kumata), ex *U. rhynchophylla* (1247); 1 ♂ & 4 ♀, same data as holotype, em. 11–25/iii/1975.

Larva: 2 exs. of spinning instar mounted on slides, same data as adult holotype, collected on 15/xi/1974.

Distribution. Japan (Kyusyu).

Food plant. *Uncaria rhynchophylla* (Miq.) Miq. (Rubiaceae).

Biology. This new species is a leaf-miner during its larval period as in the members of *Eumetriochroa* and *Metriochroa*. The mine (Fig. 27(A, B)) occurs on the upper side of leaves and is purely epidermal. It is narrowly linear, very long, tightly coiled at the young stage, then wandering on disc into an irregularly curved serpentine. It is whitish in appearance, with an irregularly interrupted, brownish line of frass in the centre. A pupal chamber is situated at the end of the mine, usually at the margin of leaf, with a swollen lower side and a wrinkled upper side as in typical pupal chambers of *Phyllocnistis* species.

The number of generations and the overwintering stage are undecided because of insufficient data of breeding material.

Remarks. This species is superficially very similar to *C. cyanolampra* Vári from South Africa and *C. aletreuta* (Meyrick) from Tanganyika, both of which are also leaf-miners of Rubiaceae, but it may be distinguished from the latter two by the upcurved costal margin of the valva, by the slender aedeagus and by the absence of signum on the corpus bursae.

Cryphiomystis yaeyamensis sp. nov.
[Figs. 11, 13(G, H), 15(D), 27(C, D)]

Adult. ♂ & ♀.

Measurement. Expanse of wings, 3.8 – 4.9 mm (3.8 mm in holotype); length of fore wing, 1.8 – 2.3 mm (1.8 mm in holotype).

Description. Almost all surfaces of head, antenna, thorax, legs and fore wing covered with dark fuscous scales, with a bluish or silvery reflection under some light, but labial palpus ochre whitish, with a fuscous apical ring, all tarsi with four short, white rings, and cilia of fore wing grayish, with three round fringe lines of black irroration around apex and along termen, inner side of the basalmost fringe line being dark fuscous. Hind wing dark gray, with cilia grayish. (Abdomen not examined, because it was mounted on slide in all the specimens.)

Male genitalia (Fig. 11(A–C)): Tegumen nearly membranous, very sparsely squamose

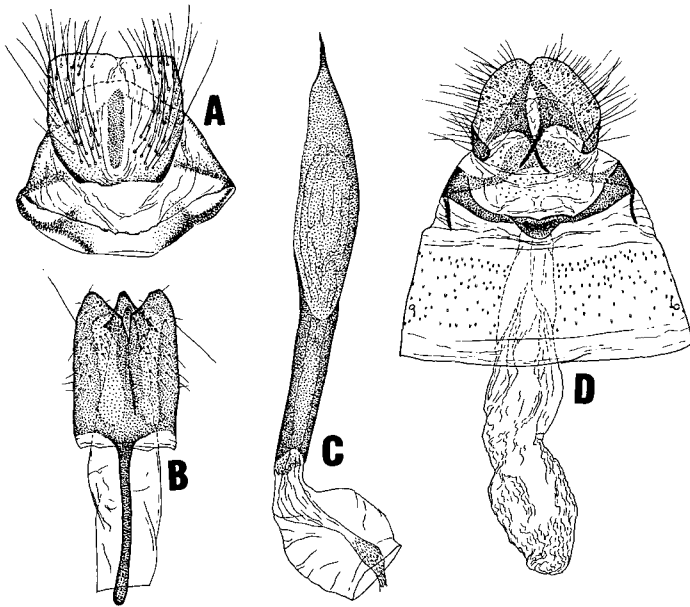


Fig. 11. *Cryphiomystis yaeyamensis* sp. nov. A: Male tegumen and tuba analis in ventral view [holotype, Gen. sl. no. Grc-5454] — B: Male valva and vinculum complex in ventral view [ditto]—C: Aedeagus [paratype, Gen. sl. no. Grc-3547] — D: Female genitalia in ventral view [paratype, Gen. sl. no. Grc-5569].

dorsally; tuba analis shortly tubular, densely setose laterally, with an oblong subscaphium. Vinculum tightly united with valvae, with saccus slender, widened at base, slightly clavated at apex, a little longer than valvae, and about two-fifths as long as aedeagus. Basally united valvae elongate quadrate in dorsoventral view, nearly parallel-sided, obtusely angulated apically, with an apical incision between valvae shallow and occupying about one-fifth length of valvae; each valva finely setose on ventral face. Fultura superior triangular apically in dorsoventral view, with its apex reaching apical level of valvae. Aedeagus cylindrical, very obliquely truncated, with a sharply pointed apex, the truncated part occupying about three-fifths length of aedeagus; cornutus absent. Eighth abdominal segment weakly sclerotized especially along caudal margin, glabrous, without any lobe at ventrum. (Three slides examined.)

Female genitalia (Fig. 11(D)): Papilla analis rather short, setose as usual, but not spinulose at all; apophysis posterioris slender, about 1.7 times as long as apophysis anterioris. Eighth abdominal segment very shortly sclerotized, slightly widened dorsally, and narrowing ventrally. Ostium bursae with a crescent-shaped lamella antevaginalis, which is laterally connected with the eighth sternite and sinuate on the caudal margin; ductus and corpus bursae membranous, with sclerous antrum and signum absent. (Four slides examined.)

Larva. Not examined.

Specimens examined. Adult: 3 ♂ & 4 ♀. Holotype: ♂, Kanpura Falls, Iriomote I., Ryukyu Is., em.10/xi/1989 (T. Kumata), ex *Saurauia tristyla* (3547), Gen. sl. no. Grc-5454, deposited in Hokkaido University. Paratypes: 2 ♂ & 4 ♀, same data as holotype, em.20/x-10/xi/1989.

Distribution. Japan (Ryukyu Islands).

Food plant. *Saurauia tristyla* DC. (Actinidiaceae).

Biology. This new species is a purely upper epidermal miner of leaves of the food plant in the larval stage, and is pupated within a pupal chamber made inside the mine. The mine (Fig. 27(C, D)) is linear, very long, irregularly curved, sometimes serpentine, and transparently whitish in appearance, without any trace of frass. The pupal chamber is placed at the end of the mine either in the disc or at the margin of the leaf, ellipsoidal, with a swollen lower side and a wrinkled upper side.

The number of generations and the overwintering stage are not yet decided, because I have only one series of bred specimens.

Remarks. *Cryphiomystis yaeyamensis* is very similar to the preceding *C. sunosei* in colour pattern, and is very difficult to distinguish from the latter by this feature. It is, however, at once distinguished from *C. sunosei*, and perhaps also from *C. cyanolampra* Vári and *C. aletreuta* (Meyrick), by the shape of the valvae and by the wholly membranous ductus and corpus bursae which have neither antrum nor signum.

APPENDIX I

A TENTATIVE CHECKLIST OF THE SUBFAMILY OECOPHYLLEMBIINAE

I. Genus *Eumetriochoa* Kumata

Eumetriochoa Kumata, 1998, present paper.

Type-species: *Eumetriochoa hederæ* Kumata, 1998.

1. *Eumetriochoa hederæ* Kumata

Eumetriochoa hederæ Kumata, 1998, present paper.

- Distribution: Japan.
Food plant: *Hedera rhombea* (Araliaceae).
2. *Eumetriochoera miyatai* Kumata
Eumetriochoera miyatai Kumata, 1998, present paper.
Distribution: Japan.
Food plant: *Ilex crenata* and *Ilex rotundata* (Aquifoliaceae).
3. *Eumetriochoera kalopanacis* Kumata
Eumetriochoera kalopanacis Kumata, 1998, present paper.
Distribution: Japan.
Food plant: *Kalopanax pictus* (Araliaceae).
4. *Eumetriochoera hiranoi* Kumata
Eumetriochoera hiranoi Kumata, 1998, present paper.
Distribution: Japan.
Food plant: *Styrax japonicus* (Styracaceae).
- II. Genus *Prophyllonistis* Davis
Prophyllonistis Davis, 1994, Trop. Lepid. 5: 67.
Type-species: *Prophyllonistis epidrimys* Davis, 1994.
5. *Prophyllonistis epidrimys* Davis
Prophyllonistis epidrimys Davis, 1994, Trop. Lepid. 5: 67.
Distribution: Chile.
Food plant: *Drimys winteri andina*, and *D. winteri chiliensis* (Winteraceae).
- III. Genus *Metriochoera* Busck
Metriochoera Busck, 1900, Proc. U. S. nat. Mus. 23: 244.
Type-species: *Metriochoera psychotriella* Busck, 1900.
Oecophyllembius Silvestri, 1908, Boll. Lab. Zool. Portici 2: 196.
Type-species: *Oecophyllembius neglectus* Silvestri, 1908 = *Gracilaria* (sic) *latifoliella* Milliere, 1887.
6. *Metriochoera latifoliella* (Milliere)
Gracilaria (sic) *latifoliella* Milliere, 1887, Ann. Soc. Ent. Fr.: 219; Grandi, 1933, Boll. Lab. Ent. Bologna 5:237.
Parectopa latifoliella: Meyrick, 1912, Cat. Lep. 6: 48.
Metriochoera latifoliella: Vári, 1961, Transvaal Mus., Mem. 12: 196.
Oecophyllembius neglectus Silvestri, 1908, Boll. Lab. Zool. Portici 2: 199; *ibid.*, 1912, Boll. Lab. Zool. Portici 6: 178.
Distribution: South Europe.
Food plants: *Olea* spp. and *Philyrea* spp. (Oleaceae).
7. *Metriochoera psychotriella* Busck
Metriochoera psychotriella Busck, 1900, Proc. U. S. Nat. Mus. 23: 245.
Distribution: North and Central America.
Food plant: *Psychotria undata* (Rubiaceae).
8. *Metriochoera inferior* (Silvestri), comb. nov.
Oecophyllembius inferior Silvestri, 1915, Boll. Lab. Zool. Portici 9: 266.
Distribution: Ethiopia.
Food plant: *Olea chrysophylla* (Oleaceae).

9. *Metriochroa pergulariae* Vári

Metriochroa pergulariae Vári, 1961, Transvaal Mus., Mem. 12: 197.

Distribution: South Africa.

Food plant: *Pergularia extensa* (Asclepiadaceae).

10. *Metriochroa tylophorae* Vári

Metriochroa tylophorae Vári, 1961, Transvaal Mus., Mem. 12: 198.

Distribution: South Africa.

Food plant: *Tylophora cordata* (Asclepiadaceae).

11. *Metriochroa argyrocelis* Vári

Metriochroa argyrocelis Vári, 1961, Transvaal Mus., Mem. 12: 199.

Distribution: South Africa.

Food plant: *Impatiens sylvicola* (Balsaminaceae).

12. *Metriochroa carissae* Vári

Metriochroa carissae Vári, 1963, Dtsch. ent. Z. (N. F.) 10: 8.

Distribution: Ethiopia.

Food plant: *Carissa edulia* (Apocynaceae).

13. *Metriochroa scotinopa* Vári

Metriochroa scotinopa Vári, 1963, Dtsch. ent. Z. (N. F.) 10: 9.

Distribution: Ethiopia.

Food plant: *Dregea schimperii* (Asclepiadaceae).

14. *Metriochroa celidota* Bradley

Metriochroa celidota Bradley, 1965, Ruwenz. Exp. 1952, 2 (12): 110.

Distribution: Uganda.

Food plant: Unknown.

15. *Metriochroa fraxinella* Kumata

Metriochroa fraxinella Kumata, 1998, present paper.

Distribution: Japan.

Food plants: *Fraxinus sieboldiana*, *Ligustrum japonicum* and *Ligustrum micranthum* (Oleaceae).

16. *Metriochroa syringae* Kumata

Metriochroa syringae Kumata, 1998, present paper.

Distribution: Japan.

Food plant: *Syringa reticulata* (Oleaceae).

IV. Genus *Guttigera* Diakonoff

Guttigera Diakonoff, 1955, Verh. Akad. Wet. Amst. (2) 50, no. 3: 84.

Type-species: *Guttigera rhythmica* Diakonoff, 1955.

17. *Guttigera rhythmica* Diakonoff

Guttigera rhythmica Diakonoff, 1955, Verh. Akad. Wet. Amst. (2) 50, no. 3: 85.

Distribution: New Guinea.

Food plant: Unknown.

18. *Guttigera albicaput* Diakonoff

Guttigera albicaput Diakonoff, 1955, Verh. Akad. Wet. Amst. (2) 50, no. 3: 86.

Distribution: New Guinea.

Food plant: Unknown.

V. Genus *Cryphiomystis* Meyrick

Cryphiomystis Meyrick, 1922, Exotic Microlep. 2: 563.

Type-species: *Cryphiomystis pentarcha* Meyrick, 1922.

19. *Cryphiomystis pentarcha* Meyrick

Cryphiomystis pentarcha Meyrick, 1922, Exotic Microlep. 2: 563; Vári, 1961, Transvaal Mus., Mem. 12: 200.

Distribution: Sri Lanka.

Food plant: Unknown.

20. *Cryphiomystis aletreuta* (Meyrick)

Parectopa aletreuta Meyrick, 1936, Exotic Microlep. 5: 38.

Cryphiomystis aletreuta: Vári, 1961, Transvaal Mus., Mem. 12: 201.

Acrocercops chalybophanes Meyrick, 1937, Exotic Microlep. 5: 98.

Distribution: Tanganyika.

Food plants: *Coffea arabica*, *C. robusta* and *C. liberica* (Rubiaceae).

21. *Cryphiomystis cyanolampra* Vári

Cryphiomystis cyanolampra Vári, 1961, Transvaal Mus., Mem. 12: 201.

Distribution: South Africa.

Food plant: *Burchellia bubalina* (Rubiaceae).

22. *Cryphiomystis praeustella* (Deventer), comb. nov.

Heliozela praeustella Deventer, 1904, Tijdschr. Ent. 47: 7.

Distribution: Indonesia.

Food plant: *Sarcocephalus cordatus* (= *Nauclea cordata*) (Rubiaceae).

23. *Cryphiomystis sunosei* Kumata

Cryphiomystis sunosei Kumata, 1998, present paper.

Distribution: Japan.

Food plant: *Uncaria rhynchophylla* (Rubiaceae).

24. *Cryphiomystis yaeyamensis* Kumata

Cryphiomystis yaeyamensis Kumata, 1998, present paper.

Distribution: Japan.

Food plant: *Saurauia tristyla* (Actinidiaceae).

APPENDIX II

A LIST OF FOOD PLANTS OF THE SUBFAMILY OECOPHYLLEMBIINAE

Food plant	Leaf-miner
<i>Burchellia</i> (Rubiaceae)	<i>Cryphiomystis cyanolampra</i> [S. Africa]
<i>Carissa</i> (Apocynaceae)	<i>Metriochoa carissae</i> [Ethiopia]
<i>Coffea</i> (Rubiaceae)	<i>Cryphiomystis aletreuta</i> [Tanganyika]
<i>Dregea</i> (Asclepiadaceae).....	<i>Metriochoa scotinota</i> [Ethiopia]
<i>Drimys</i> (Winteraceae)	<i>Prophyllonistis epidrimys</i> [Chile]
<i>Fraxinus</i> (Oleaceae)	<i>Metriochoa fraxinella</i> [Japan]
<i>Hedera</i> (Araliaceae)	<i>Eumetriochoa hederae</i> [Japan]
<i>Ilex</i> (Aquifoliaceae)	<i>Eumetriochoa miyatai</i> [Japan]
<i>Impatiens</i> (Balsaminaceae)	<i>Metriochoa argyrocelis</i> [S. Africa]
<i>Kalopanax</i> (Araliaceae)	<i>Eumetriochoa kalopanaxis</i> [Japan]
<i>Ligustrum</i> (Oleaceae)	<i>Metriochoa fraxinella</i> [Japan]
<i>Olea</i> (Oleaceae)	<i>Metriochoa inferior</i> [Ethiopia]
	<i>Metriochoa latifoliella</i> [S. Europe]

<i>Pergularia</i> (Asclepiadaceae).....	<i>Metriochroa pergulariae</i> [S. Africa]
<i>Philyrea</i> (Oleaceae)	<i>Metriochroa latifoliella</i> [S. Europe]
<i>Psychotria</i> (Rubiaceae)	<i>Metriochroa psychotriella</i> [C. America]
<i>Sarcocephalus</i> (Rubiaceae)	<i>Cryphiomystis praeustella</i> [Indonesia]
<i>Saurauia</i> (Actinidiaceae)	<i>Cryphiomystis yaeyamensis</i> [Japan]
<i>Styrax</i> (Styracaceae)	<i>Eumetriochroa hiranoi</i> [Japan]
<i>Syringa</i> (Oleaceae)	<i>Metriochroa syringae</i> [Japan]
<i>Uncaria</i> (Rubiaceae)	<i>Cryphiomystis sunosei</i> [Japan]
<i>Tylophora</i> (Asclepiadaceae).....	<i>Metriochroa tylophorae</i> [S. Africa]
[Unknown]	<i>Cryphiomystis pentarcha</i> [Sri Lanka]
	<i>Guttigera albicaput</i> [New Guinea]
	<i>Guttigera rhythmica</i> [New Guinea]
	<i>Metriochroa celidota</i> [Uganda]

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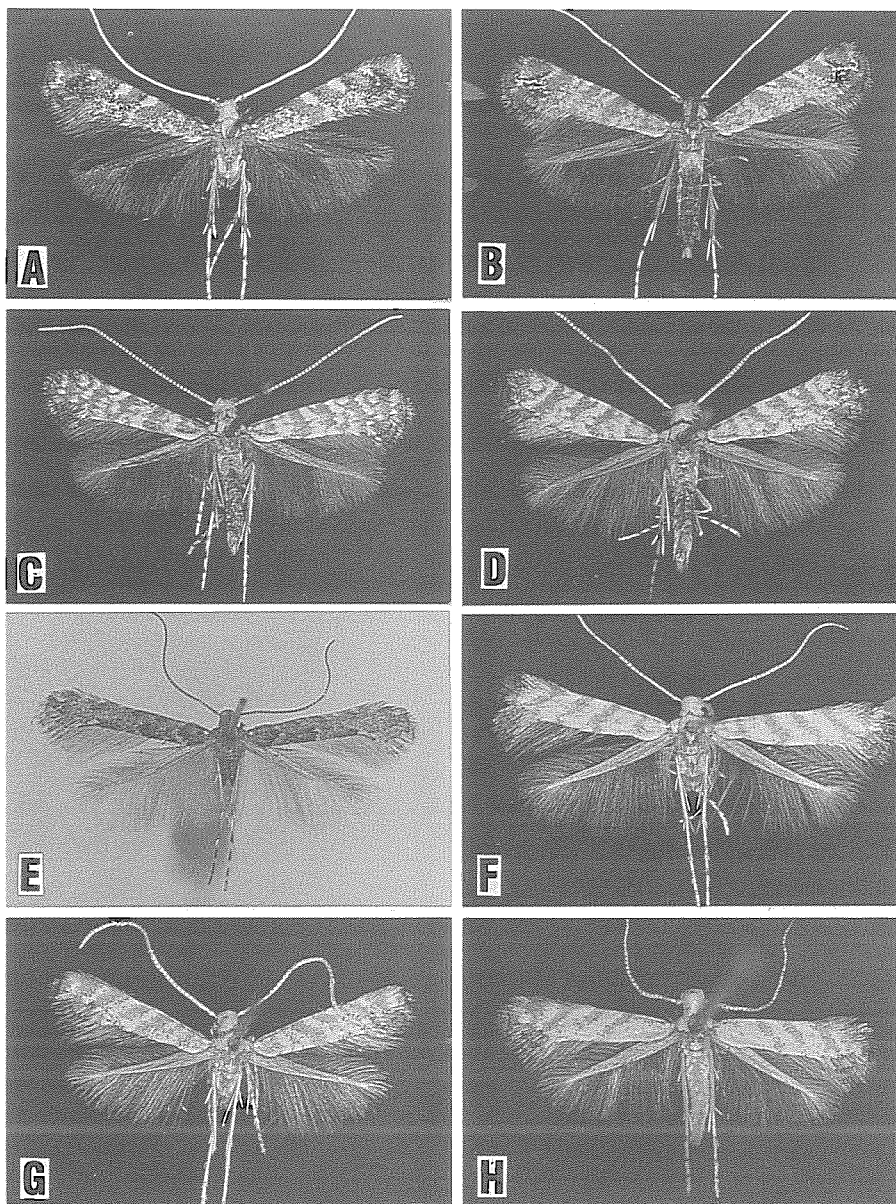
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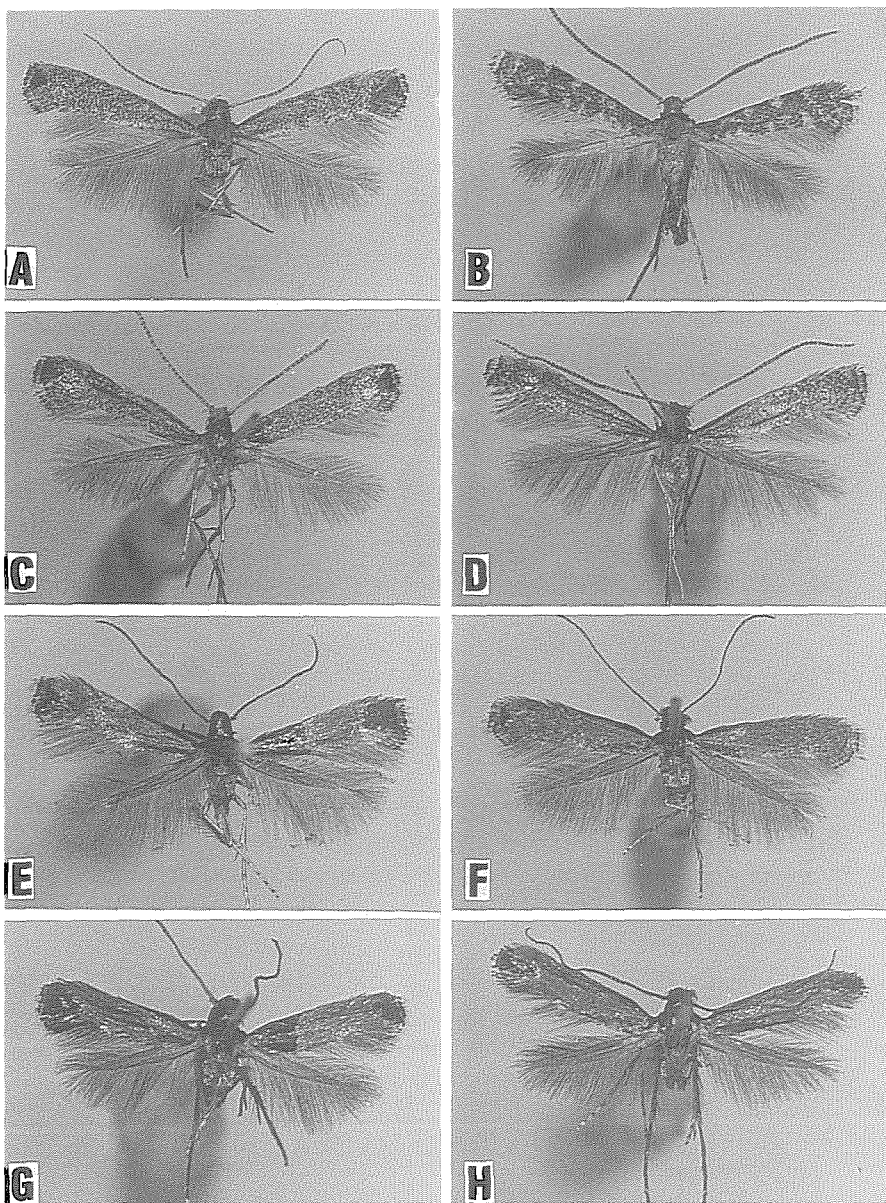
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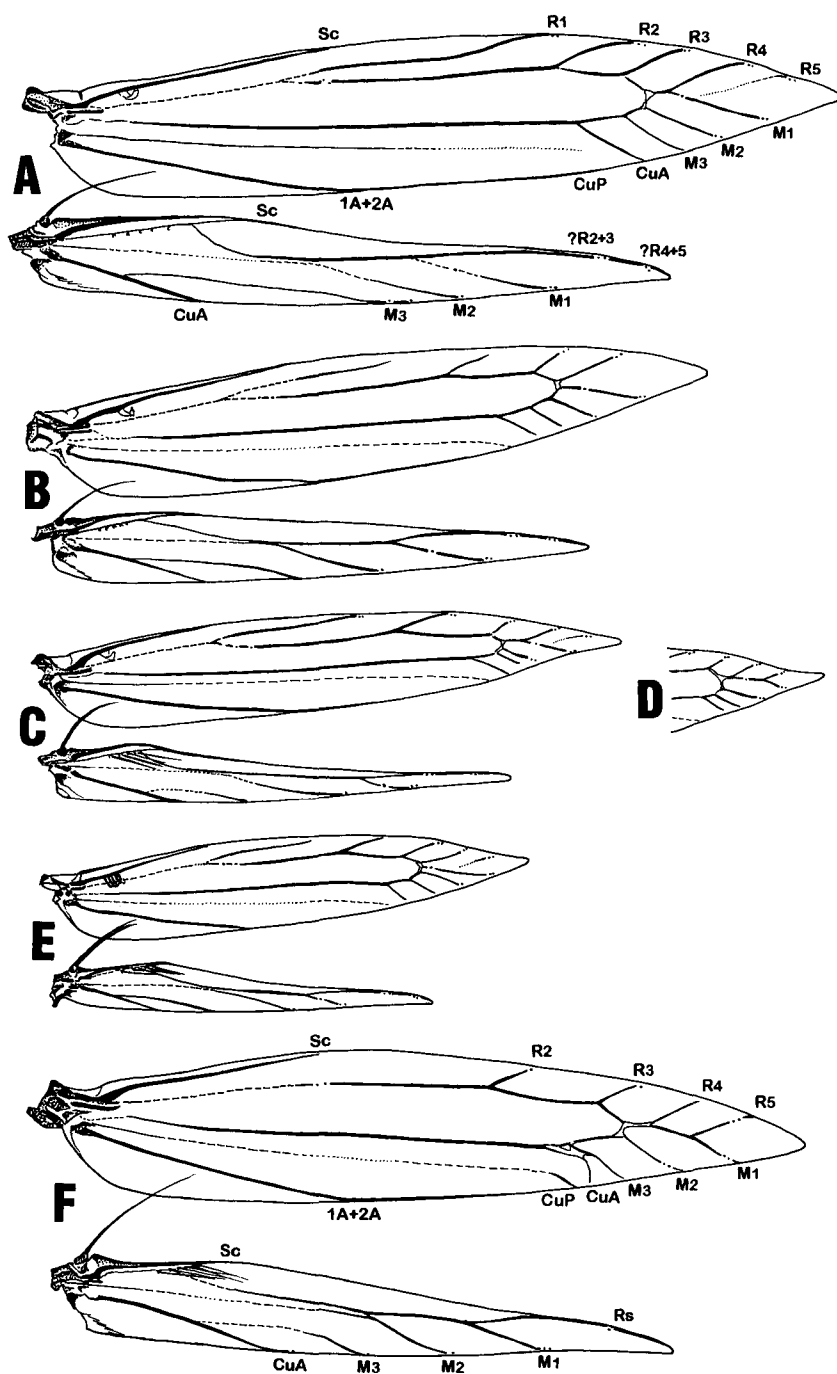
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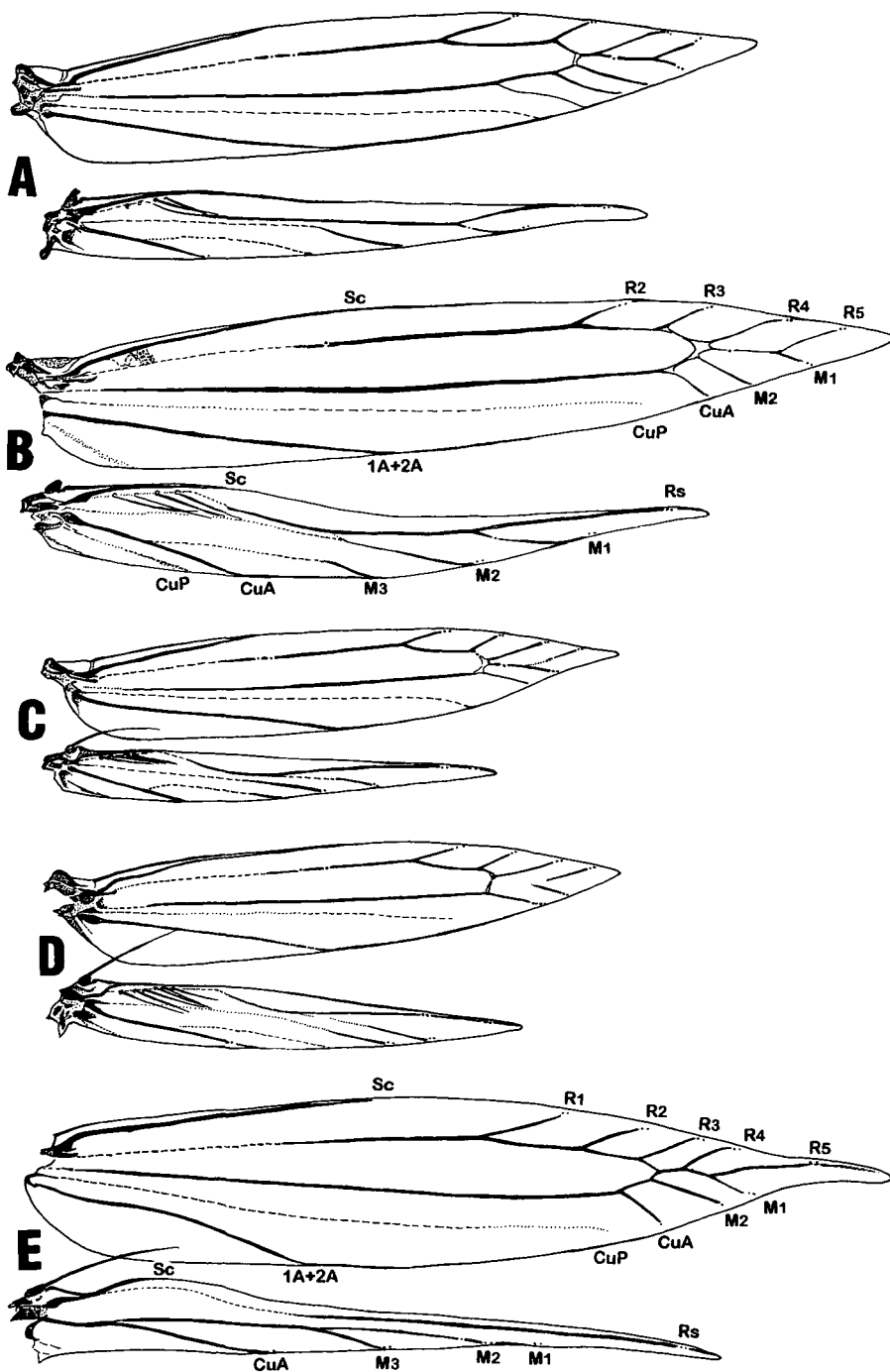
Pl. I: Fig. 12. Adult moths. A: *Eumetriochoa hederæ* sp. nov. [holotype] — B: Ditto [paratype] — C: *Eumetriochoa miyatai* sp. nov. [paratype, vernal form] — D: Ditto [paratype, vernal form] — E: *Eumetriochoa kalopanacis* sp. nov. [paratype, autumnal form] — F: Ditto [paratype, aestival form] — G: *Eumetriochoa hiranoi* sp. nov. [holotype] — H: Ditto [paratype].



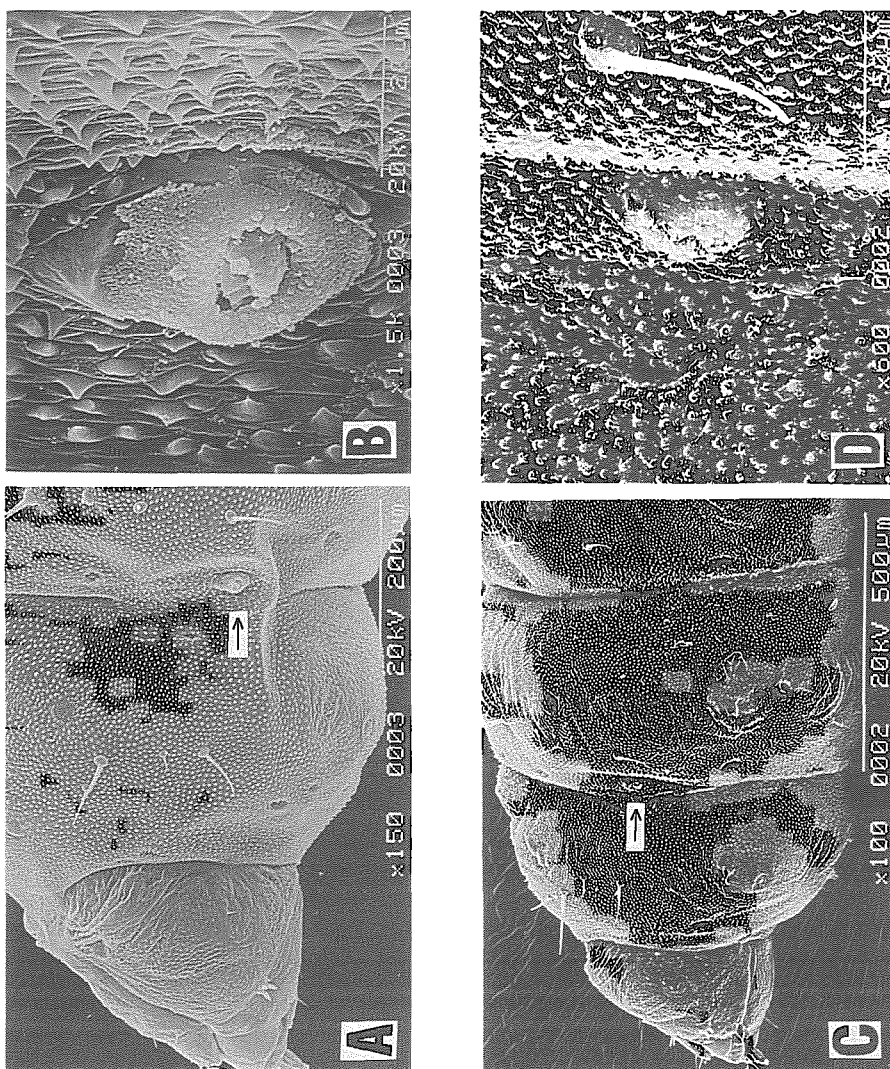
Pl. II: Fig. 13. Adult moths. A: *Metriochroa fraxinella* sp. nov. [paratype, ex *Fraxinus*] — B: Ditto [paratype, Ogasawara Is., ex *Ligustrum*] — C: *Metriochroa syringae* sp. nov. [holotype] — D: Ditto [paratype] — E: *Cryphiomystis sunosei* sp. nov. [holotype] — F: Ditto [paratype] — G: *Cryphiomystis yaeyamensis* sp. nov. [paratype] — H: Ditto [paratype].



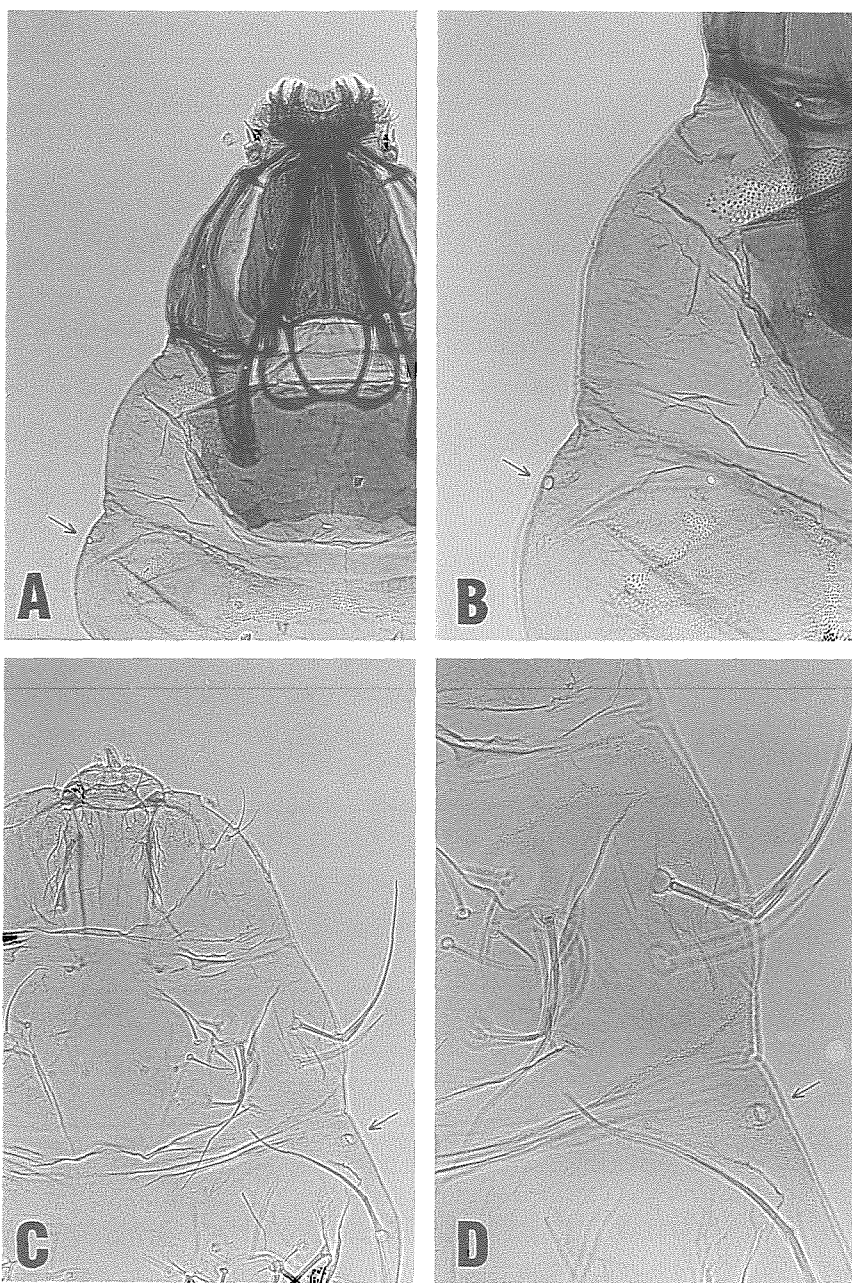
Pl. III: Fig. 14. Wing venations. A: *Eumetriochroa hederae* sp. nov. — B: *Eumetriochroa miyatai* sp. nov. — C: *Eumetriochroa kalopanacis* sp. nov. — D: Ditto, apical part of fore wing [Daisetuzan, Hokkaido] — E: *Eumetriochroa hiranoi* sp. nov. — F: *Metriochroa latifoliella* (Milliere) [Caglien, Italy].



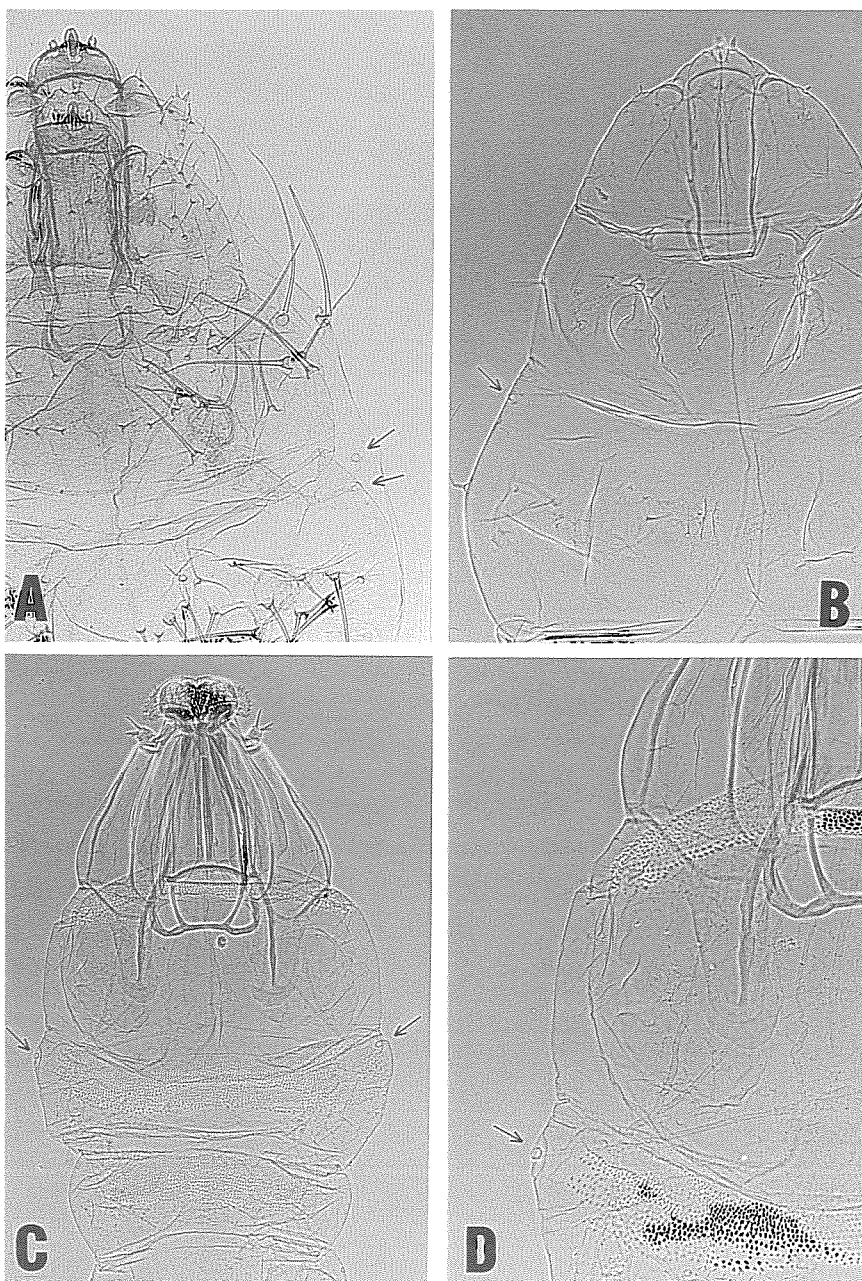
Pl. IV: Fig. 15. Wing venations. A: *Metriochoera fraxinella* sp. nov. — B: *Metriochoera syringae* sp. nov. — C: *Cryphiomystis sunosei* sp. nov. — D: *Cryphiomystis yaeyamensis* sp. nov. — E: *Phyllocnistis* sp. [Sapporo, Hokkaido, ex *Chloranthus japonicus* (89)].



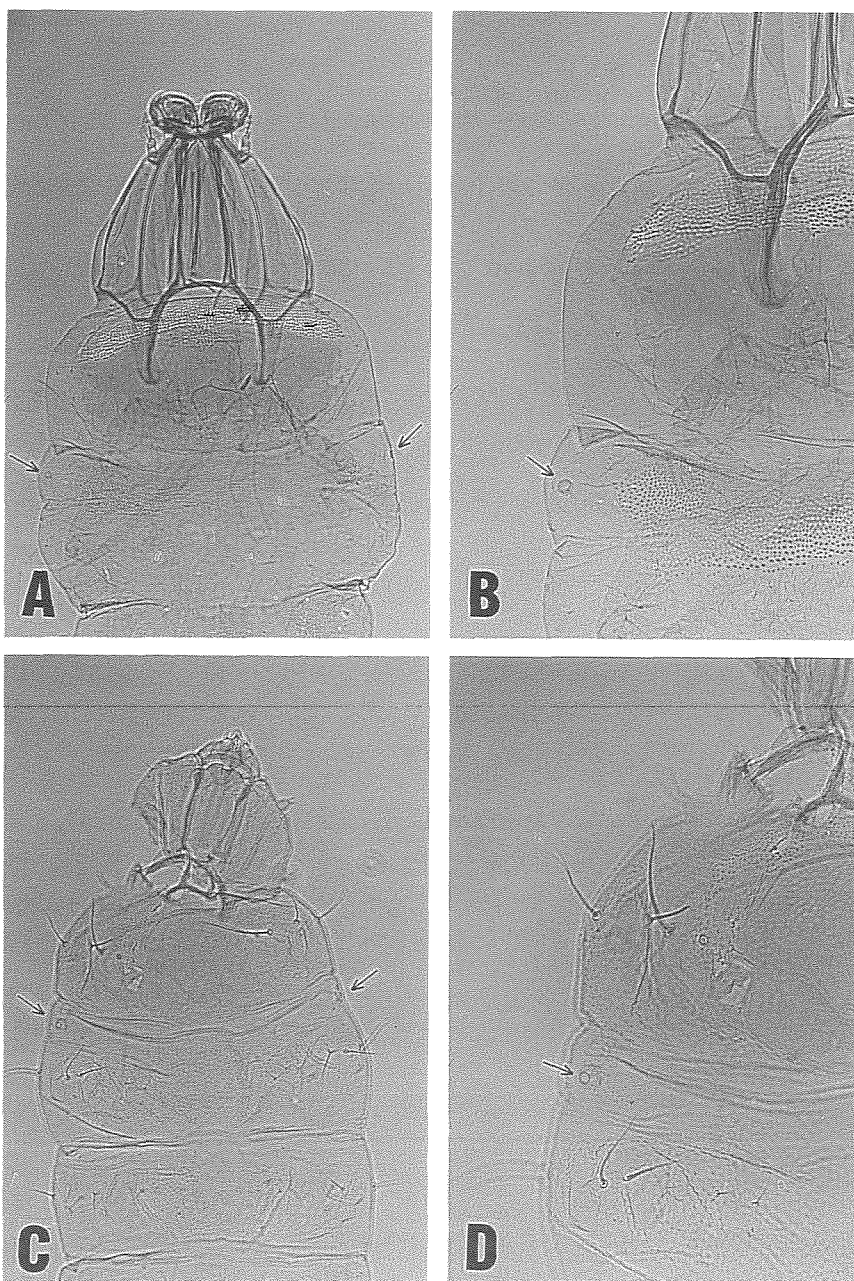
Pl. V: Fig. 16. Larvae of last spinning instar of *Cryphiomystis* sp. A & C: Cephalic part of larvae, arrow showing thoracic spiracle [Mt. Halcon (200 m), Mindro I., Philippines, ex *Fagraea racemosa* (5165)] — B & D: Thoracic spiracle enlarged.



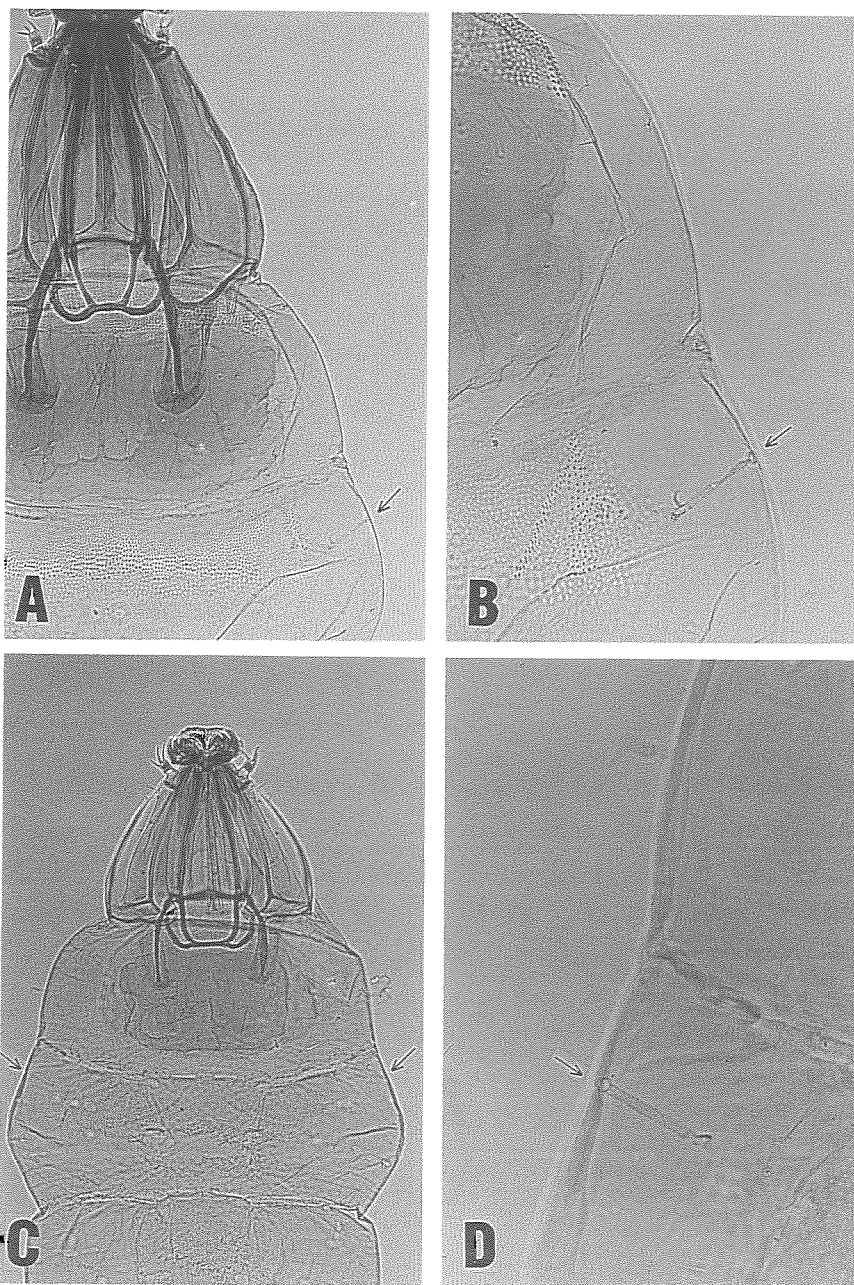
Pl. VI: Fig. 17. Larvae of *Eumetriochoa hederæ* sp. nov. A: Cephalic part of last sap-feeding instar [breeding no. 5294] — B: Ditto, spiracular area enlarged — C: Cephalic part of last spinning instar [ditto] — D: Ditto, spiracular area enlarged. (Arrow showing thoracic spiracle.)



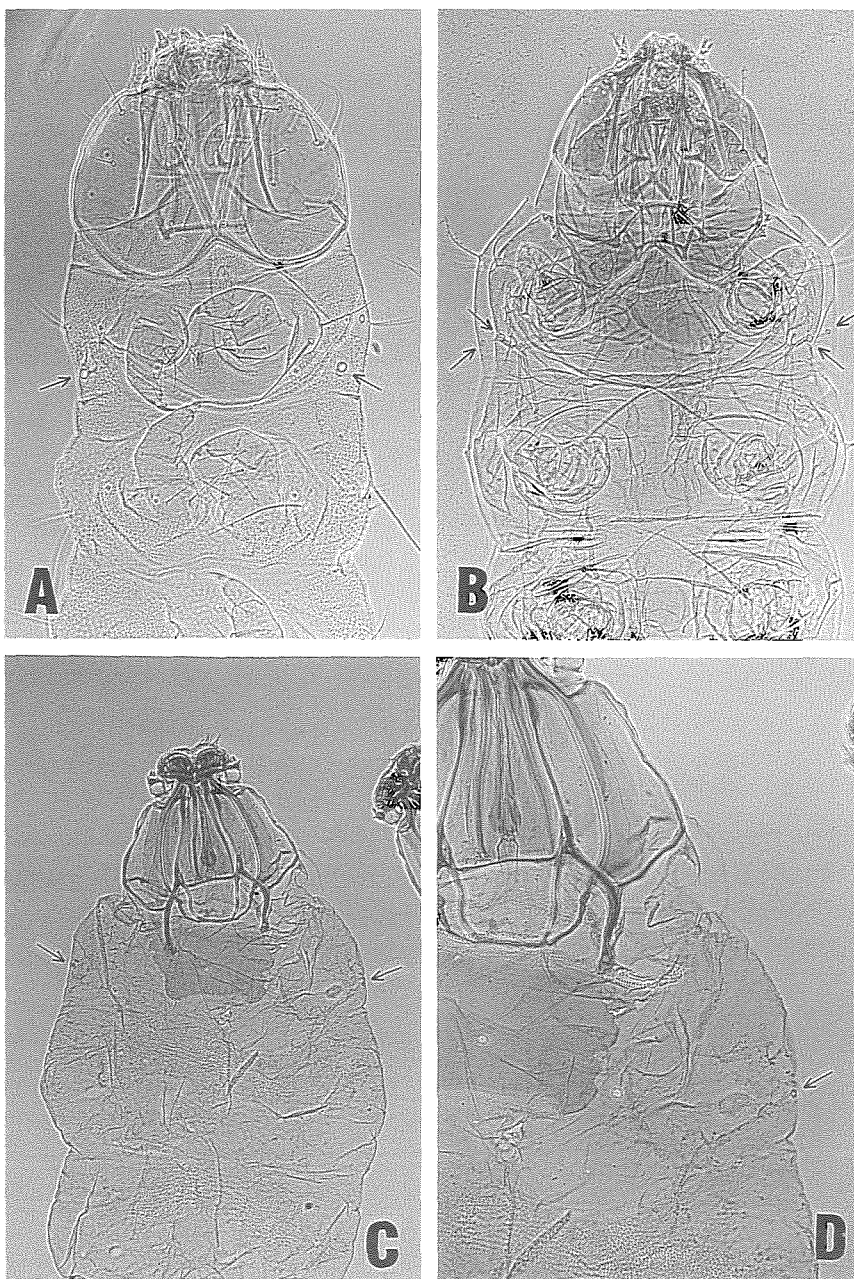
Pl. VII: Fig. 18. A: Larvae of *Eumetriochoera hederae* sp. nov., cephalic part of spinning instars (second spinning instar surrounded by exuviae of first spinning instar) [breeding no. 1266]. B-D: Larvae of *Eumetriochoera miyatai* sp. nov. B: Cephalic part of last spinning instar [breeding no. 1269] — C: Cephalic part of last sap-feeding instar [ditto] — D: Ditto, spiracular area enlarged. (Arrow showing thoracic spiracle.)



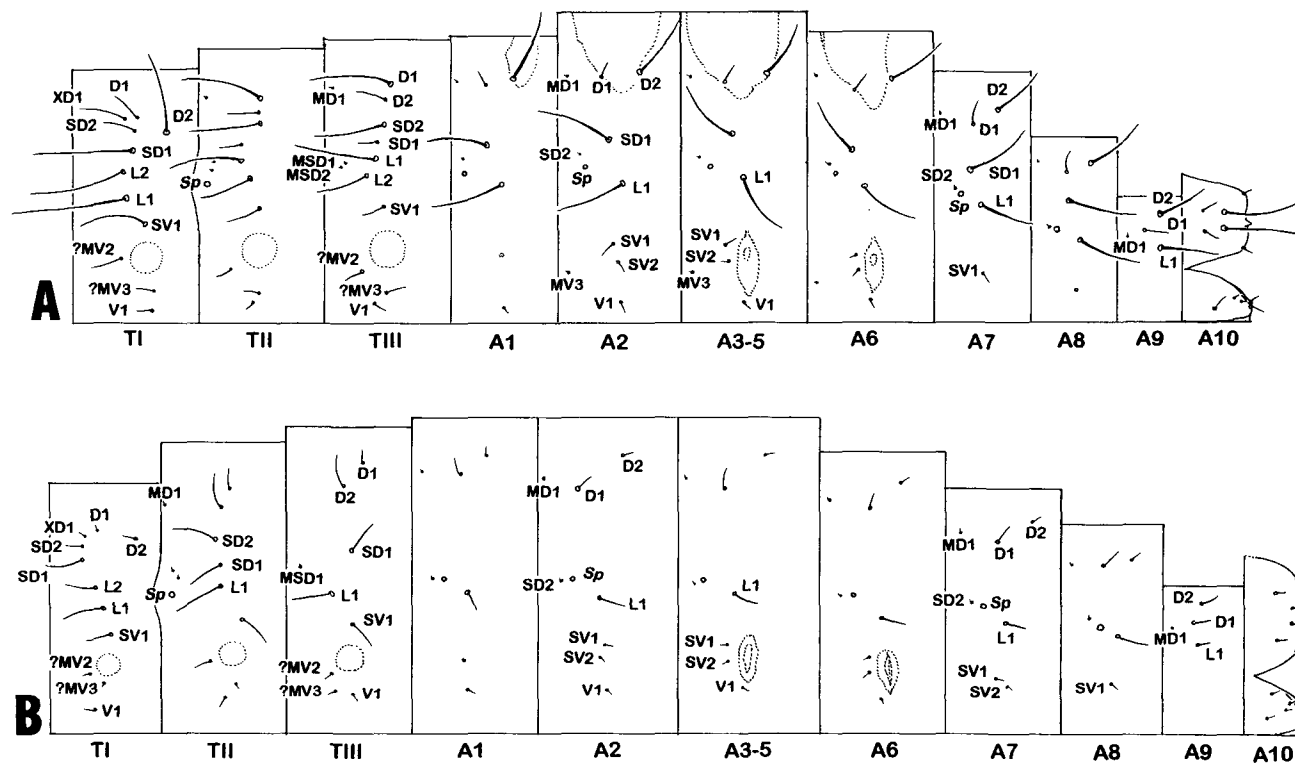
Pl. VIII: Fig. 19. Larvae of *Eumetriochoera hiranoi* sp. nov. A: Cephalic part of last sap-feeding instar [breeding no. 1628, Nisinasuno, Totigi-ken, Honsyu] — B: Ditto, spiracular area enlarged — C: Cephalic part of last spinning instar [ditto] — D: Ditto, spiracular area enlarged. (Arrow showing thoracic spiracle).



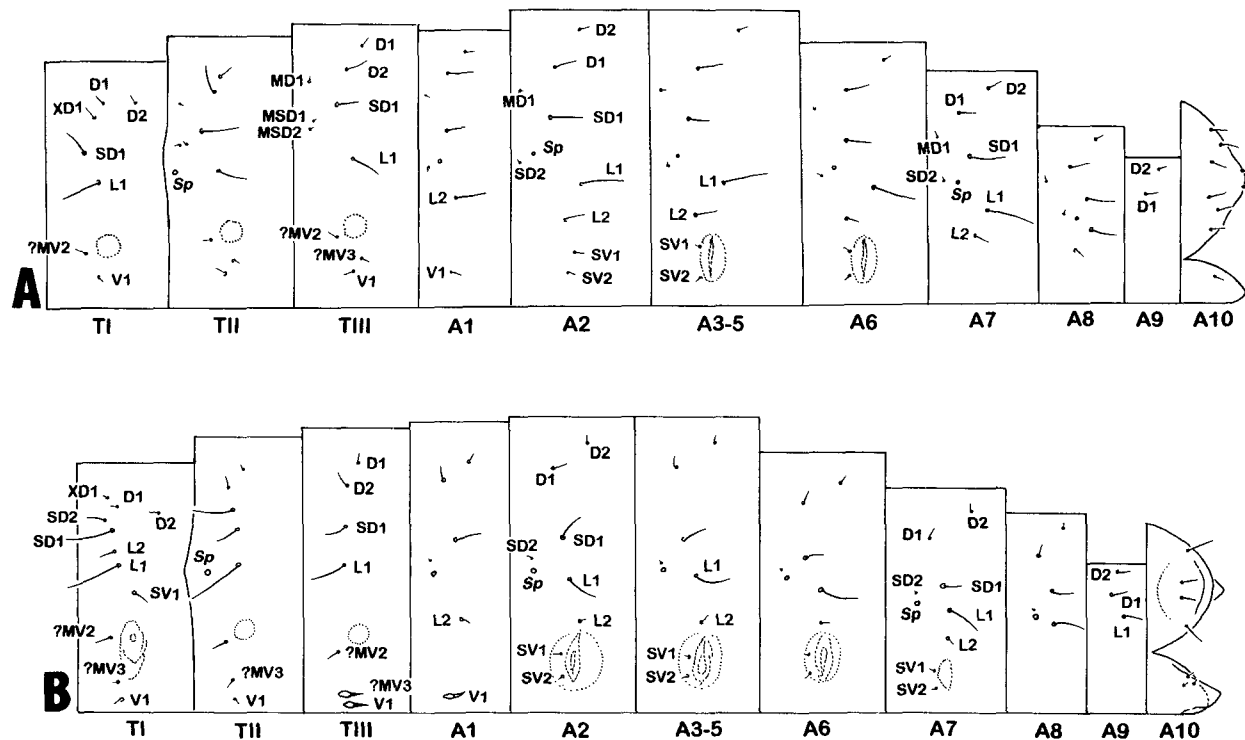
Pl. IX: Fig. 20. A & B: Larva of *Eumetriochroa* sp. A: Cephalic part of last sap feeding instar [breeding no. Ind-54, Darjeeling, West Bengal, India, ex *Ilex* sp.] — B: Ditto, spiracular area enlarged. C & D: Larva of *Metriochroa syringae* sp. nov. C: Cephalic part of sap-feeding instar [breeding no. 5300] — D: Ditto, spiracular area enlarged. (Arrow showing thoracic spiracle.)



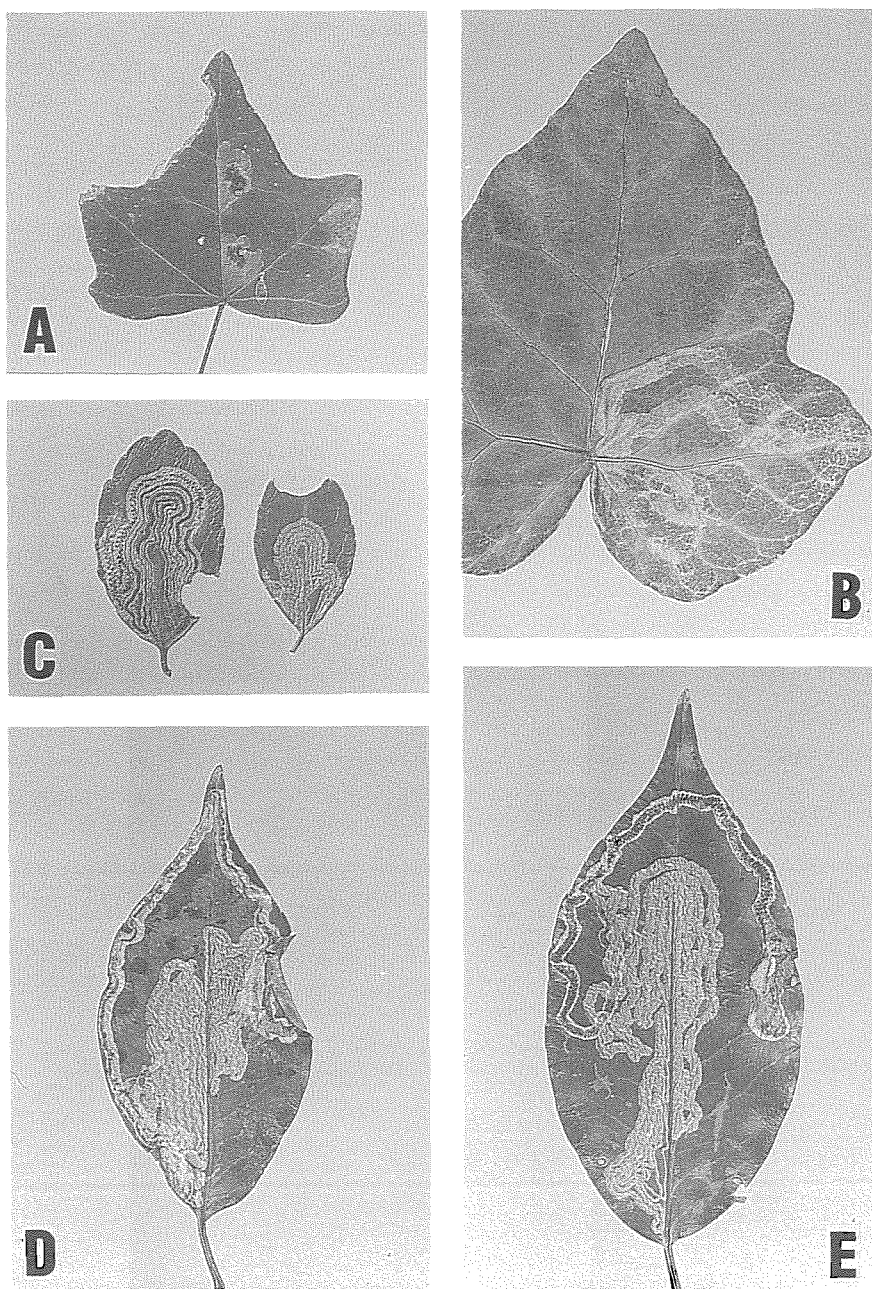
Pl. X: Fig. 21. A: Larva of *Caloptilia mandshurica* (Christoph), cephalic part of tissue-feeding instar. B: Larva of *Phyllonorycter pulchra* (Kumata), cephalic part of tissue-feeding instar. C & D: Larva of *Phyllocnistis* sp. C: Cephalic part of last sap-feeding instar [breeding no. 5296, Sapporo, Hokkaido, ex *Chloranthus japonicus*] — D: Ditto, spiracular area enlarged. (Arrow showing thoracic spiracle.)



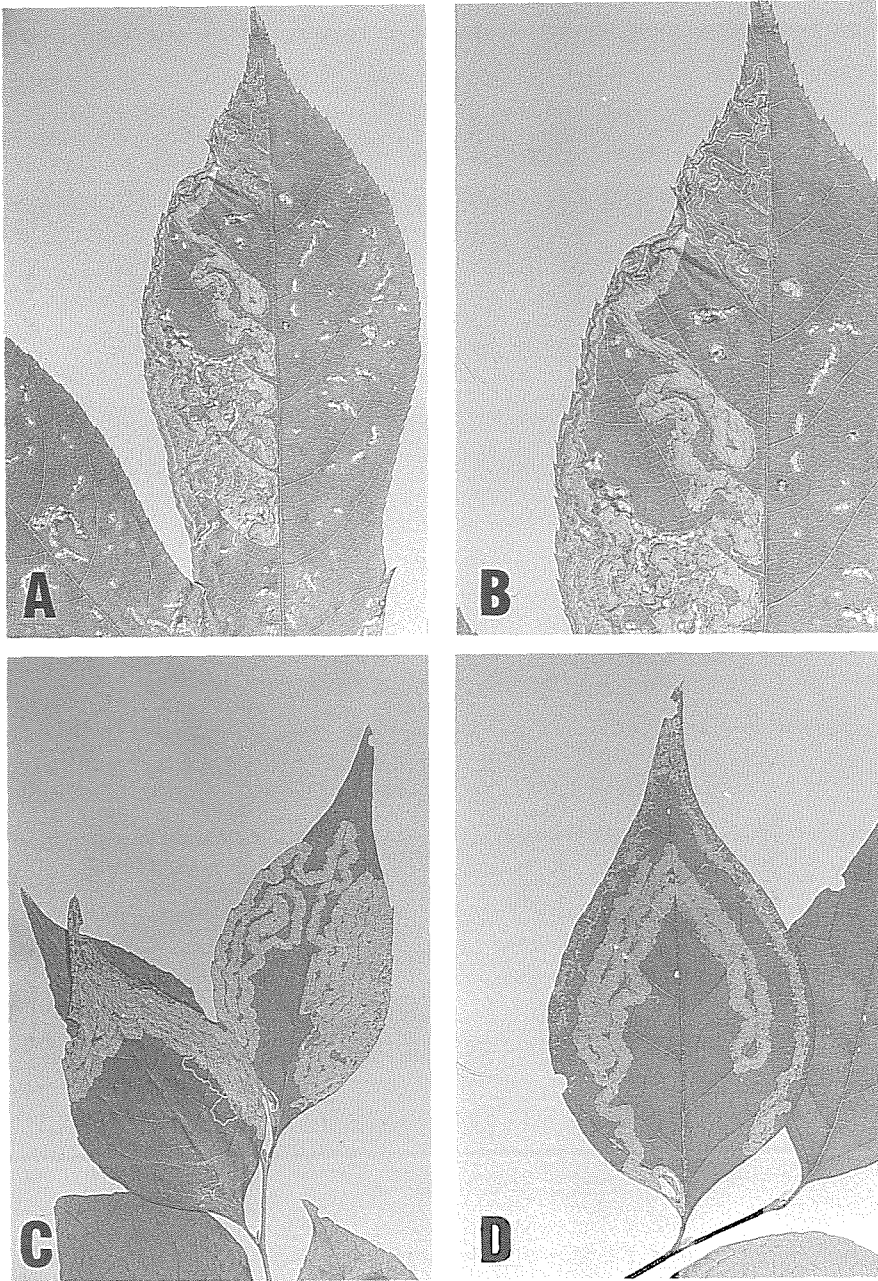
Pl. XI: Fig. 22. Larval body chaetotaxy of last spinning instar. A: *Eumetriochroa hederæ* sp. nov. —
 B: *Eumetriochroa miyatai* sp. nov.



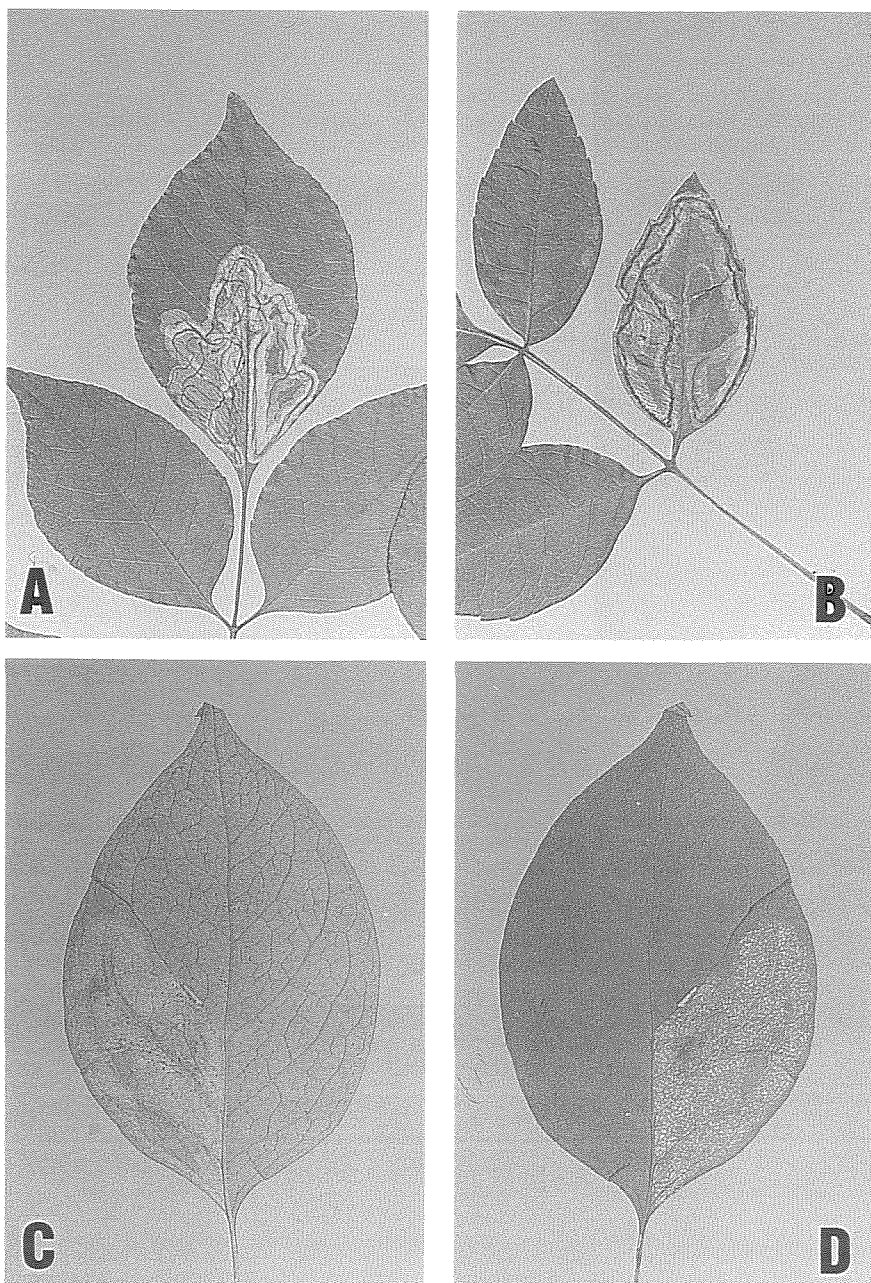
Pl. XII: Fig. 23. Larval body chaetotaxy of last spinning instar. A: *Metriochoera syringae* sp. nov. —
 B: *Cryphiomystis sunosei* sp. nov.



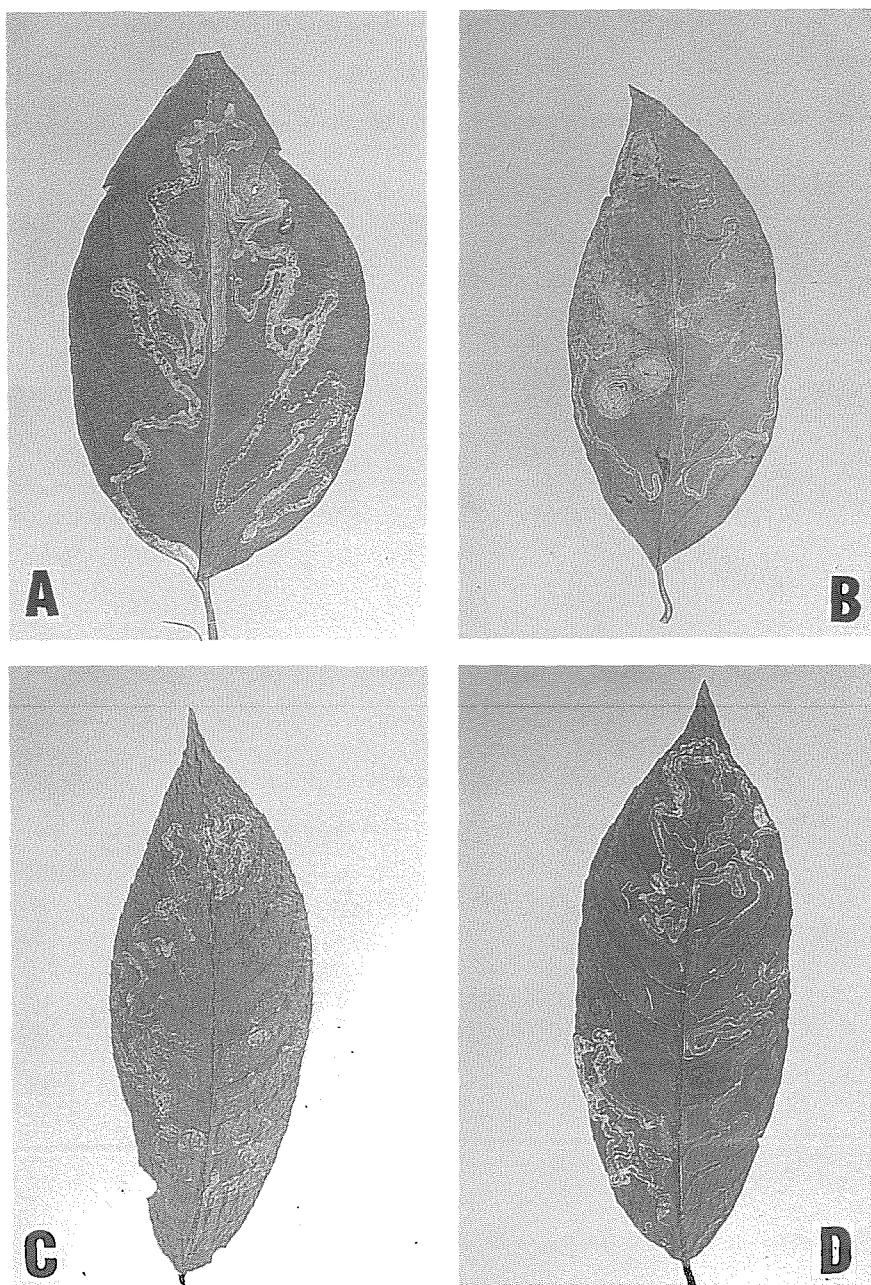
Pl. XIII: Fig. 24. Leaf-mines. A: *Eumetriochroa hederae* sp. nov. on *Hedera rhombea* (upper side) [breeding no. 835, Nati, Wakayama-ken, Honsyu, 18/x/1966] — B: Ditto [breeding no. 1266, Odawara, Kanagawa-ken, Honsyu, 27/iii/1974] — C: *Eumetriochroa miyatai* sp. nov. on *Ilex crenata* (upper surface) [breeding no. 1175, Noziri-ko, Nagano-ken, Honsyu, 17/ix/1973] — D & E: Ditto on *Ilex pedunculosa* (upper side) [Ueno, Azusagawa-mura, Nagano-ken, Honsyu, 13/vi/1992].



Pl. XIV: Fig. 25. Leaf-mines. A & B: *Eumetriochroa kalopanacis* sp. nov. on *Kalopanax pictus* (upper side) [breeding no. 1051, Osirakawa, Nagano-ken, Honsyu, 2/iii/1992] — C: *Eumetriochroa hiranoi* sp. nov. on *Styrax japonicus* (upper side) [breeding no. 1514, Kisohukusima, Nagano-ken, Honsyu, 23/ix/1975] — D: Ditto [Ikezawa, Ikusaka-mura, Nagano-ken, Honsyu, 3/viii/1989].



Pl. XV: Fig. 26. Leaf-mines. A: *Metriochroa fraxinella* sp. nov. on *Fraxinus* sp. (upper side) [breeding no. 667, Hikosan, Kyusyu, 21/vi/1965] — B: Ditto [Siobara, Totigi-ken, Honsyu, 1/x/1975] — C: *Metriochroa syringae* sp. nov. on *Syringa reticulata* (lower side) [Sapporo, Hokkaido, 15/ix/1969] — D: Ditto (upper side) [ditto].



Pl. XVI: Fig. 27. Leaf-mines. A & B: *Cryphiomystis sunosei* sp. nov. on *Uncaria rhynchophylla* (upper side) [breeding no. 1247, Kagosima, Kyusyu, 22/x/1973] — C & D: *Cryphiomystis yaeyamensis* sp. nov. on *Saurauia tristyla* (upper side) [breeding no. 3547, Kanpira Falls, Iriomote I., Ryukyu Is., 26/x/1989].